Malawi PEN-Plus Operational Plan

2021

NCDI POVERTY NETWORK

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Foreword

Over the past decade, the substantial burden of Non-Communicable Diseases (NCDs) has received increasing recognition. Historically, NCDs have been under-recognized in low-income countries such as Malawi, where a significant proportion of the population suffers from a diverse burden of NCDs in addition to the devastating communicable conditions. While previously framed as diseases of the rich and the urban, recent years have shed light on the fact that NCDs are a diverse group of conditions that also greatly affect the lives and wellbeing of people living in poverty and in rural areas.

To advance our collective knowledge on this important problem, a global *Lancet* Commission was published in September 2020: *The Lancet NCDI Poverty Commission: bridging a gap in universal health coverage for the poorest billion.* This Commission emphasized the need to expand on the 5x5 model of NCDs, which includes five conditions (cardiovascular disease, cancer, diabetes, chronic respiratory disease, and mental health) based on five risk factors (tobacco, physical inactivity, unhealthy diets, alcohol, and air pollution). This was previously the 4x4 model (before mental health and air pollution were added), and this focus of the global agenda means we have previously failed to address the substantial disease burden among the world's poorest.

As part of the global *Lancet* Commission's efforts, national-level NCDI Poverty Commissions were launched in more than 15 countries worldwide, including Malawi. The Malawi NCDI Poverty Commission, co-chaired by the Deputy Director of NCDs in Malawi's Ministry of Health and Population, published its report in 2018. Malawi's Commission found that a third of the burden of premature mortality and disability in the country is caused by NCDIs, and furthermore that 69% of this is caused by conditions outside of cardiovascular disease, cancer, chronic respiratory disease, and diabetes. In short, the Commission recommended expanding our view of programs, funding, and advocacy to a much broader and critical range of NCDs. The Commission prioritized 38 NCDI conditions, many of which are not addressed through prevention efforts targeting the lifestyle risk factors, require treatment, and are impacting Malawi's young and the workforce. The list included several conditions that are severe and complex, leading the Commission to recognize the need for specialized care teams, decentralized to districts, to address them. Examples of these conditions include rheumatic heart disease, sickle cell disease, congenital heart disease, and type 1 diabetes or type 2 insulin dependent diabetes. It is this gap in the health system – caring for these severe, chronic conditions – that forms the basis of PEN-Plus.

WHO's Package of Essential Noncommunicable Disease Interventions, commonly called WHO PEN, puts forward a primary care model for NCDs in low- and middle- income countries. PEN focuses mainly on chronic conditions that are part of the 4x4 model and can be managed well with basic interventions at the primary level: type 2 diabetes, hypertension, and asthma. PEN-Plus builds on this model of care, putting forward the staffing, training, interventions, and commodities needed at first-level (district) hospitals. Put simply, *PEN-Plus is a model of decentralized care for first-level hospitals for severe, chronic NCDs.* It means an integrated and specialized team of mid-level providers – clinical officers and nurses – working at every district and community hospital to care for patients with diseases such as type 1 diabetes and rheumatic heart disease.

In August 2019, through a regional consultation, the WHO Regional Office for Africa (WHO AFRO) recognized the importance of exploring PEN-Plus with member countries. PEN-Plus acknowledges the need for more specialized clinical skills, intense mentorship, and advanced laboratory and imaging capacity required to care for these patients – resources that primary care does not provide. In doing so, it

decentralizes this care from central hospitals and at the same time provides every district with a specialized NCD team available to mentor primary care staff and receive referrals of patients from primary care who may need more advanced clinical management. Ultimately, PEN-Plus is designed to fill a critical gap at the district and community hospital level required to take care of Malawians suffering from this wide array of severe chronic conditions.

Planning and scale-up of PEN-Plus in Malawi is urgent and paramount as the NCD burden continues to grow and affect all segments of the population, placing an increasing burden of morbidity and mortality on the poor. This operational plan was developed to guide scale-up and identify practical ways to implement PEN-Plus across the country. The plan draws from a large volume of stakeholder consultation across MOHP, clinical implementing partners, civil society, and other technical partners, building on the work of the NCDI Poverty Commission. The plan also draws from existing PEN-Plus experience in Malawi, including projects led by the MOHP with support from the World Diabetes Foundation and the Neno District MOHP team with support from Partners In Health and Helmsley Charitable Trust.

The PEN-Plus operational plan details the current situation for care for severe and complex chronic NCDs in Malawi. It then goes on to outline the model of care including the care continuum, staffing, interventions, training and mentorship, commodities, and M&E. We are confronted with critical next steps in governance, funding, human resource development, supply chain, and data systems, and we are confident that by building on existing systems and leveraging our substantial community of experts, advocates, academics, partners, and civil society we will make significant progress in addressing this critical burden of disease in Malawi.

National PEN-Plus implementation will require political will, partner engagement, funding, and a strong understanding of the NCDI burden we are addressing. The PEN-Plus consultation group is optimistic that together we can develop a pro-poor pathway in treating severe and chronic NCDs in Malawi, complementing existing NCD interventions within an inclusive agenda rooted in equity for a comprehensive NCD response in Malawi. This will help move us toward a brighter future for all present and future patients suffering from this wide array of conditions, ensuring no one is left behind.

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Abbreviations and Acronyms

AFRO	WHO Regional Office for Africa
APZU	Abwenzi Pa Za Umoyo (Partners In Health – Malawi)
CHAM	Christian Health Association of Malawi
CHW	Community Health Worker
CMST	Central Medical Stores Trust
DALY	Disability Adjusted Life Year
DHIS2	District Health Information System 2
DHMT	District Health Management Team
DHO	District Health Office
DMO	District Medical Officer
DNO	District Nursing Officer
DHS	Demographic and Health Survey
HMIS	Health Management Information System
HSA	Health Surveillance Assistant
HSSP-II	Health Sector Strategic Plan II (2017-2022)
M&E	Monitoring and Evaluation
MOHP	Ministry of Health and Population
NCDs	Noncommunicable Diseases
NCDIs	Noncommunicable Diseases and Injuries
PEN	Package of Essential Noncommunicable Disease Interventions
PEN-Plus	Package of Essential Noncommunicable Disease Interventions–Plus
PIH	Partners In Health
SPA	Service Provision Assessment
STEPS	STEPwise approach to surveillance
T1D	Type 1 diabetes
WDF	World Diabetes Foundation
WHO	World Health Organization

Situation Analysis

Malawi is a landlocked, densely populated country in southern Africa, with a population larger than neighboring Zambia's in just one-eighth the land area.[1] Malawi's population is overwhelmingly rural, poor, and young. Four out of five Malawians live in rural areas, and almost three-quarters live below the international poverty line, on less than $1.90 per day.[2] With a median age of 16.5, fifteen percent of Malawi's population is younger than five, more than half (54%) are less than 20, and 84% are under the

age of 40. The population is growing at an annual rate of 2.9%, which ranks as the 15th highest rate in the world.[1]

Malawi's health system will need to expand to meet the increased demand from its young and rapidly growing population. Demand for free or subsidized health services is high, and even though most government facilities do not charge user fees, the health system is under-resourced and short on capacity. Malawi's economy grew at a rate of 3.5-4% per annum between 2013 and 2018, but the growth has not been strong enough for the government to meet the demand for health services in the country. Reasons for this include the susceptibility of the economy to frequent macroeconomic and fiscal shocks, the low domestic tax base that restricts government revenues, and high dependence on the agricultural sector, which is highly vulnerable to droughts, floods, and the impact of climate change.[3]

The government's resource envelope for health continues to be insufficient to meet the demand for health services. In 2018, current health expenditures in Malawi totaled $35 per capita, less than half the estimated $86 per capita required to achieve universal health coverage for essential primary care services in low-income countries.[4,5] Development aid plays a key role in bridging the gap in resources available for health, with aid accounting for 53% of total health expenditure. Government spending accounts for 29% of total health expenditures, with household spending (out-of-pocket) for the remaining 18%.[5]

Basic Description of the Malawian Health System

Healthcare is delivered through both the public and private sectors in Malawi. The public sector accounts for 86% of all healthcare facilities and almost 60% of healthcare services delivery.[6] Public facilities run by the Ministry of Health and Population (MOHP) provide services free of charge at the point of care, while the private sector (which consists of both for-profit and not-for-profit providers) charges user fees for its services. The MOHP has Service Level Agreements with the largest private provider – the Christian Health Association of Malawi (CHAM) – for government-funded provision of free maternal, neonatal, and selected child health services.[6]

Health services are delivered at four levels – community, primary, secondary, and tertiary – which are linked by a referral system.

- At the **community level**, health services are provided by Health Surveillance Assistants (HSAs) and at community-based facilities, including health posts, dispensaries, village clinics, and health centers. Under the MOHP-established integrated community case management approach, HSAs provide promotive and preventive health services for uncomplicated cases of malaria, pneumonia, diarrhea, newborn sepsis, and malnutrition through outreach and door-to-door visitation, and refer patients to higher levels of care as necessary. While HSAs make up approximately half of the healthcare workers in Malawi, challenges exist in numbers, falling short of the 1 HSA per 1000 population target; distribution, with less than half living in their catchment area; and capacity for supportive supervision.[7]
- The **primary care level** delivers out-patient and maternity services through 790 established health centers (557 of which are in rural areas).
- At the **secondary care level, 24 district hospitals** offer both in-patient and out-patient services to the local catchment population. These hospitals also function as referral facilities for health centers and rural hospitals in the district. CHAM hospitals also provide secondary level health

care. There are 41 community and rural hospitals, of which 38 are in rural areas, including some that deliver more complex services and procedures.

- The **tertiary level** of care is comprised of five central hospitals, each of which provides specialized health services.

What Is Known about the NCDI Burden of Disease in Malawi

Noncommunicable diseases and injuries (NCDIs) account for a large and growing share of the burden of disease in Malawi. The Malawi NCDI Poverty Commission was established by the MOHP in 2016 with the mandate to provide a situational analysis of the epidemiologic and socioeconomic baseline of the burden of NCDIs; to estimate the current coverage of NCDI interventions; and to identify priority NCDI conditions and cost-effective interventions to address them. The Commission Report, published in 2018, found that NCDs account for around a quarter of disability-adjusted life years (25.4%) and an even larger share of deaths (29%) in Malawi.[8] More than 60% of NCD DALYs in Malawi occur before the age of 40, and 62% are attributed to conditions that are not related to common behavioral and metabolic risk factors.

Baseline Service Availability for NCDs

Malawi's Health Sector Strategic Plan II (HSSP-II), published in 2017, acknowledges that "resource constraints prevent many curative interventions targeting non-communicable diseases from being included in the EHP (Essential Health Package)." Only 11% of total government health expenditures and 7% of total external funding for health were dedicated to NCDs in 2017, according to Malawi's National Health Accounts. With limited resources available for NCD services, priority has been given to prevention through health promotion and education and to management of common and less complex conditions at the health center and community level.

The Essential Health Package detailed in the HSSP, which focuses on primary care, includes only seven interventions for NCD conditions, including screening for cervical cancer and medications and treatment for diabetes, hypertension, depression, and epilepsy. The estimated cost of full implementation for those interventions would amount to just 1.5% of the cost of implementing the entire EHP. But in 2015-16, the NCD category received less than 1% of what would be required to fully implement even this limited set of interventions included in the EHP.

Most of these interventions are included in the World Health Organization's Package of Essential Noncommunicable (PEN) Disease Interventions for Primary Health Care in Low-Resource Settings, which is designed to address common and less severe NCDs such as mild-to-moderate hypertension, type 2 diabetes, and asthma at the primary care level. In Malawi, this package was adapted and piloted at Kasungu District Hospital in 2012. Thereafter, the World Diabetes Foundation (WDF) provided additional funding to the Ministry of Health to roll out primary care for patients with hypertension and diabetes. This effort was implemented initially through trainings and commodity provision in 17 facilities in 16 districts in the north and central regions from 2015 to 2018. In 2018, WDF awarded additional funding to the Ministry of Health to expand efforts to the southern region while maintaining support in the north and central regions.[9] Following the NCDI Poverty Commission report and with consideration of the identified severe chronic NCDs, the team changed tactics with this implementation to pursue a progressive decentralization approach. This involved focusing on hospital-level care for NCDs across the south, setting the groundwork for PEN-Plus through district-level NCD teams and clinics that functionally operate as a hybrid between PEN and PEN-Plus. The WDF project also incorporated mentors – expert mid-level

clinicians employed specifically to travel to district clinics and provide on-site structured clinical mentorship, data system oversight, and operational support as well as linking with district leadership teams.

Data from the Malawi Service Provision Assessment (SPA) 2013-14 show the availability of equipment, supplies, and medications needed to provide both chronic and acute care for several NCDs, including asthma, hypertension, heart failure, rheumatic heart disease, type 1 and type 2 diabetes, and epilepsy. SPA also provides data on availability for two cross-cutting services that are important for NCDs and injuries – surgery and palliative care.[10]

But the SPA data reveal that, with the exception of acute epilepsy (likely due to availability of oral benzodiazepines), equipment and medications required to treat this limited set of NCDs are available at less than 20% of facilities both at lower levels of the health system (health centers and clinics) and at all facilities in rural areas. Even among Malawi's district hospitals, essential equipment and medications to treat most of these conditions are not available at 50% or more of facilities. In this analysis, none of the district hospitals was equipped to treat acute asthma, for example, which required the presence of nebulizing equipment, medication, peak flow meters, and spacers for inhalers. Just half of the district hospitals were ready to treat heart failure, and that number only increased to 58% when the requirement for an ultrasound machine was waived. Regarding diabetes, the SPA includes equipment such as a scale, blood pressure apparatus, and height board; Hemoglobin A1C machines were not included in the SPA data.

Table 1. Availability of Essential Medications and Equipment for Treatment of NCDs[8]

Availability of Essential Medications and Equipment for Treatment of NCDs at Different Levels of the Health System and in Urban vs. Rural Facilities

Condition	Referral hospitals (n=4)	**District Hospitals (n=24)**	Health centers + clinics (n=790)	All facilities urban (n=299)	All facilities rural (n=678)
Acute asthma	0%	**0%**	0%	1%	0%
Chronic asthma	25%	**4%**	2%	7%	1%
Acute diabetes	75%	**42%**	1%	7%	1%
Acute epilepsy	75%	**96%**	78%	67%	82%
Heart failure	75%	**50%**	1%	11%	3%
Heart failure (without ultrasound)	75%	**58%**	18%	38%	15%
Hypertension	75%	**17%**	1%	6%	1%
Palliative care	100%	**83%**	3%	18%	5%
RHD	75%	**42%**	1%	9%	3%
Type 1 diabetes	100%	**75%**	2%	14%	4%
Type 2 diabetes	100%	**63%**	12%	32%	9%

The share of facilities with staff who have been trained to treat NCDs is even smaller. According to SPA data, only a third or fewer of all hospitals in Malawi report that they provide services and have staff trained to treat diabetes (29%), cardiovascular disease (34%), and chronic respiratory disease (23%). The share of

health centers and clinics providing services with trained staff is even lower – 5% for diabetes, 10% for cardiovascular disease, and 8% for chronic respiratory disease.

Priority Conditions and Interventions

Using a priority-setting framework that took account of burden of disease, equity, life expectancy, and disability, the Malawi NCDI Poverty Commission identified 33 priority NCDs to recommend for renewed attention, funding, and intervention in Malawi. These conditions represent a priority list of NCDs that cause a significant burden in Malawi, especially among younger and poorer members of the population. (See Appendix 1) The Commission, utilizing a framework of both cost-effectiveness and equity, then identified 35 treatment interventions for NCDs delivered at referral hospitals, district hospitals, primary care facilities, and in the community.

The conditions and interventions prioritized by the Malawi NCDI Poverty Commission include several of the common, less severe conditions – such as asthma, type 2 diabetes, hypertensive heart disease, and epilepsy – that can be prevented, managed, and treated at primary care level and in the community with interventions included in the WHO PEN package. In addition to these common NCD conditions, however, the Commission also prioritized several more severe and complex chronic conditions that cannot generally be treated at the primary care level, such as type 1 and insulin-dependent type 2 diabetes, advanced rheumatic heart disease, sickle cell disease, and chronic liver disease.

In total, 3 of the 35 NCD interventions prioritized by the Malawi NCDI Poverty Commissions would be delivered in the community; 21 at primary-care-level health centers; 7 at district hospitals; and 4 at referral hospitals.

Identifying Gaps in Service Availability for Prioritized Conditions and Interventions

The Malawi NCDI Poverty Commission estimated baseline coverage for each of its prioritized interventions, utilizing existing data from national surveys such as the Demographic and Health Survey (DHS), WHO STEPS, and SPA when available, as well as the collective knowledge and experience of the expert Commission members. The Commission found very low coverage for all but a handful of prioritized interventions, with an average of only 20% overall. Furthermore, they found that coverage was lower for more complex interventions that would be delivered at district hospitals (an average of 9%) than for interventions delivered at health centers (28%).

Consistent with the baseline coverage estimates, SPA data reveal wide gaps in availability of equipment, medications, and trained staff to deliver prioritized interventions, even for common, less severe conditions, not only at health centers but at many district hospitals.

Table 2. Availability of Equipment, Medications, & Staff[8,10]

Availability of Equipment & Medications and Trained Staff to Treat Prioritized Conditions				
Condition	**Hospitals with availability of**		**Health centers with availability of**	
	Equipment & Medications	**Trained staff**	**Equipment & Medications**	**Trained staff**
Type 2 diabetes	63%	29%	12%	5%
Cardiovascular disease	17%	34%	1%	10%
Chronic respiratory disease	4%	23%	2%	8%
Rheumatic heart disease	34%		1%	
Type 1 diabetes*	42%		2%	

**Note that availability of A1C measurement is not included in SPA.*

SPA provides limited information about service availability and gaps for treatment of more severe and complex chronic conditions that cannot generally be treated and managed at the primary care level, such as type 1 and insulin-dependent diabetes, advanced rheumatic heart disease, and sickle cell disease. What limited data is available, however, suggests that significant gaps exist. SPA reports that insulin is available at only 58% of hospitals and 19% of all facilities that offer services for diabetes. Similarly, just 50% of hospitals and 7% of all facilities have ultrasound capacity that would be required to diagnose and treat advanced rheumatic heart disease, and only 18% of hospitals and 6% of all facilities offering treatment for chronic respiratory disease have beclomethasone inhalers.[10]

Introduction of PEN-Plus efforts in Malawi

At a regional consultation convened in Kigali in 2019, WHO AFRO highlighted the gap in chronic care for more severe, complex NCDs, particularly in rural areas, and reviewed a draft regional strategy to address this gap through decentralized, integrated outpatient services at first-level hospitals (PEN-Plus).[11]

Prior to this meeting, Malawi's MOHP in collaboration with the NGO Partners In Health–Abwenzi Pa Za Umoyo (PIH – APZU) had successfully developed and implemented a Malawian model for a PEN-Plus Clinic in Neno District. Neno District has a population of about 140,000 people and is in the southwest zone – one of the poorest and most rural districts in Malawi. The first two outpatient clinics for integrated care of complex NCDs opened at Neno District Hospital and Lisungwi Community Hospital late in 2017. The two PEN-Plus clinics are staffed by an integrated care team consisting of clinical officers, nurses, and clerks, who are overseen by an internal medicine physician and a nurse mentor. All staff received specialized training for complex NCDs prior to the launch of the clinic, with regular refresher trainings thereafter. The training was paired with on-site clinical mentorship. The clinics rapidly enrolled patients with complex NCDs, including type 1 diabetes and rheumatic heart disease, who had previously been seen in the district's outreach program that provided integrated HIV-NCD care at the two hospitals and 12 health centers in their catchment areas. Over the first year of operations, approximately 260 patients were enrolled into the two PEN-Plus clinics. In 2019 the PEN-Plus staff launched a mentorship program for the primary care clinics to improve diagnosis, linkage to care, and retention in care for patients with severe NCDs.

An expert Stakeholder Consultation Group was established by the Malawi MOHP in 2019 to consider and plan for implementation of this PEN-Plus strategy. The Stakeholder Consultation Group comprised experts representing a broad range of clinical specialties and organizations, spanning government departments, academic institutions, implementing organizations, NGOs, and civil society. (See Appendix 2) Building off

of previous work of the National NCDI Poverty Commission, the consultation group identified as priorities 20 severe NCD conditions requiring complex chronic care services best delivered at first-level hospitals. (See Appendix 3)

Based on available evidence and experience, the Stakeholder Consultation Group found gaps in capacity and readiness to deliver all of these services consistently. Endocrine disorders, including type 1 and type 2 diabetes, were the only conditions for which the consultation confirmed with an unequivocal "yes" that services are available at district hospitals. But even availability of these services was deemed "not consistent." The stakeholder consultation concluded that services for the other 17 prioritized conditions are only available at "some", "few", or "no" district hospitals, citing problems with lack of diagnostic equipment and supplies, unavailability and stockouts of essential medicines, and inadequate training in essential competencies.

Table 3. Severe Conditions & Treatment Availability at District Hospitals

Severe Conditions Prioritized by Stakeholder Consultation Group and Availability of Treatment at District Hospitals			
Family	Condition	Is treatment for this available at district hospitals?	Comments
Endocrine	Type 1 Diabetes	Yes	Not consistent. Significant concerns about insulin supply chain and gaps in supply, particularly in districts. A1C rarely available. Chemistry testing can be very inconsistent in the districts.
	Type 2 Diabetes (insulin dependent)	Yes	Not consistent; same as above.
	Thyroid conditions	Yes	Not consistent
	Congenital Adrenal Hyperplasia	Some of them	Not consistent
Cardiovascular	Rheumatic Heart Disease	Some of them	Medications not always available. Diagnostic echocardiography often not available.
	Stroke	Some of them	Only if not severe
	Hypertension	Some of them	Diagnosis available, drug stock outs
	Ischemic Heart Disease	Some of them	No ECG in districts, drug stock outs
	Heart Failure	Some of them	Drug stock outs
	Congenital Heart Anomalies	Some of them	Poor diagnostic capability
	Anticoagulation	No	No drugs, no INR
Hematology	Sickle Cell Disease	Some of them	Districts are missing hydroxyurea; some are missing adequate morphine and pain medication and PCN prophylaxis, inadequate diagnostics at district level
	Anemia	Some of them	Inadequate supply of blood and some medications, missing diagnostics
	Hemophilia	No	Factor and diagnostics are even difficult at central level
Gastrointestinal	Chronic Liver Disease	Some of them	Treatments are mainly available but there are no good options for chronic hepatitis. Diagnostics lack LFTs, viral hepatitis screening. Quality of radiography is limited.
Neurologic	Epilepsy (severe / uncontrolled)	Some of them	Inconsistent, have first line medications but not for uncontrolled, often medications have side effects

Severe Conditions Prioritized by Stakeholder Consultation Group and Availability of Treatment at District Hospitals			
Family	Condition	Is treatment for this available at district hospitals?	Comments
	Cerebral palsy & developmental delay (treatment for complications, not cure)	Few	Most of this is supportive and counseling – feeding, some physiotherapy, ECD, assisted devices are difficult to obtain and more training and awareness is needed
	Stroke	Few	At district more risk factor and complication treatment
Pulmonary	Chronic Respiratory Disease (severe uncontrolled)	Some of them	Inhaled salbutamol and oral steroids are available at district hospitals and some have nebulizers. Generally inhaled steroids and spacers not available.
Renal	Chronic Kidney Disease	Few	Just some, particularly if the district is regularly visited by central hospital specialists

PEN-Plus and Progressive Decentralization – A Strategy to Fill the Gap

Malawi faces a gap in availability and quality of services for both severe and common NCDs and injuries – especially in rural areas and at lower levels of the health system. The PEN-Plus model, advanced by WHO AFRO, represents a proven approach for filling this critical gap – not just in service delivery, but also in the continuum of care, human resources, medications and supplies, and monitoring and evaluation for severe NCDs – through a process of progressive decentralization. Progressive decentralization is a deliberate effort to increase availability of services at more remote and/or lower levels of care in a stepwise fashion. For example, in PEN-Plus, this would mean ensuring availability of echocardiography at all district hospitals, then all community hospitals. Certain services may aim for decentralization all the way to the primary care level, while others may target hospitals. This stepwise approach ensures that efforts in training, mentorship, supervision, and quality can accompany availability in a comprehensive way.

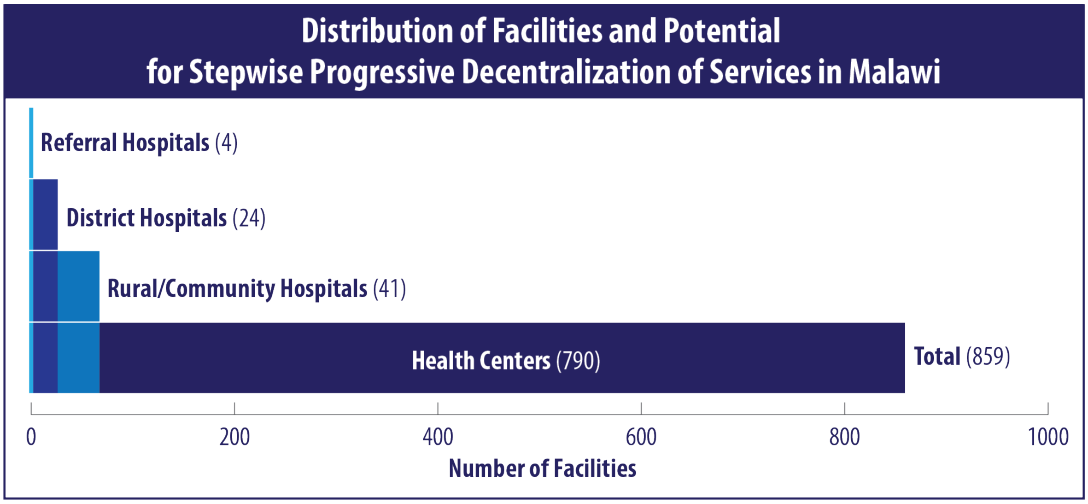

Figure 1. Progressive Decentralization

By 2020, the PEN-Plus strategy has been implemented successfully at two hospitals in Neno District and endorsed by the Malawi Stakeholder Consultation Group. Furthermore, the existing WDF funding to

support hospitals, with emphasis on the southern region, has been strategically attached to the PEN-Plus concept. This has involved leveraging the experience in Neno, incorporating into the WDF-supported hospital clinics training for clinical staff on care for severe NCDs, enrollment of patients that fit into the PEN-Plus population (alongside patients with PEN conditions), and incorporating a structured mentorship approach utilizing checklists developed in Neno District. The mentors employed by the WDF grant were trained in Neno and routinely consult with the PEN-Plus team on difficult cases. In a practical way, this has set the pathway and established a foundation for progressive decentralization of complex NCD services into rural areas in all three regions in Malawi, starting at the district hospital level. This will later enable further decentralization of the less complex services to health centers throughout the districts.

Service Delivery – PEN-Plus package of care

PEN-Plus clinics provide integrated, chronic care services for many of the severe NCDs prioritized by the Malawi NCDI Poverty Commission and the Malawi Stakeholder Consultation Group. The following severe NCDs are prioritized at PEN-Plus clinics at district hospitals. For each condition, the care delivery package, which includes diagnostics and treatment capacities, is listed. This package represents the experience of the existing PEN-Plus clinic in Neno plus input from the Malawi National Stakeholder Consultation Group.

Table 4. PEN-Plus Delivery package

Disease group	Delivery package at PEN-Plus Clinics
Type 1 Diabetes	**Diagnosis** • Glucometers and HbA1c measurement to diagnose T1DM **Treatment:** • Initiate and titrate insulin therapy • Recognize and initiate management for complications, including diabetic ketoacidosis • Counseling and education on home-based care including glucose meter use • Provide diabetic foot care and retinopathy screening
Rheumatic Heart Disease	**Diagnosis/Screening** • Perform and interpret echocardiography and electrocardiography • Monitor serum chemistries and liver function tests to assess for complications of HF **Treatment** • Provide medical management of heart failure, arrhythmias and infective endocarditis • Refer to referral centers for surgical evaluation • Manage postoperative complications
Sickle Cell Disease	**Diagnosis** • Utilize tools for Sickle Cell Disease diagnosis • Develop a national screening program **Treatment** • Provide prophylactic anti-biotics and ani-malarial medications • Establish hydroxyurea as a standard of care • Provide adequate morphine to treat pain crises • Educate providers on treating acute chest syndrome, anemia and infections

Disease group	Delivery package at PEN-Plus Clinics
Chronic Kidney Disease	**Diagnosis** • Utilize diagnostic tools, including urinalysis, electrolytes, kidney function tests and ultrasound to assess for Chronic Kidney Disease and related complications **Treatment** • Treat appropriately with steroids, diuretics and angiotensin converting enzyme inhibitors • Renally dose medications and avoid nephrotoxins
Insulin-dependent Type 2 Diabetes	**Diagnosis** • Increase screening programs for early detection of type 2 diabetes • Utilize glucometers and HbA1c measurement for diagnosis **Treatment:** • Initiate and titrate insulin and oral diabetes medications • Recognize and initiate management for complications, including diabetic ketoacidosis • Counseling and education on home-based care including glucose meter use • Provide diabetic foot care and retinopathy screening
Chronic Heart Failure	**Diagnosis** • Perform and interpret echocardiography and electrocardiography • Monitor serum chemistries and liver function tests to assess for complications of Heart Failure **Treatment** • Provide medical management of heart failure and arrhythmias • Recognize indications for referral to central hospitals
Severe Hypertension	**Diagnosis** • Increase screening of blood pressure for early detection of hypertension • Evaluate for secondary causes of hypertension • Screen for complications of hypertension including Chronic Kidney Disease and Chronic Heart Failure **Treatment** • Treat severe hypertension with first- and second-line anti-hypertensives
Severe Asthma and Chronic Obstructive Pulmonary Disease (COPD)	**Diagnosis** • Diagnose clinical categories and severity of asthma and COPD • Interpret peak flow and chest radiography **Treatment** • Initiate and titrate pharmacologic therapy • Provide counseling and action plans for patients

Disease group	Delivery package at PEN-Plus Clinics
Chronic Liver Disease	**Diagnosis** • Utilize diagnostic tools, including ultrasound, liver function tests, hepatitis screening, serum chemistries and complete blood counts to diagnose and assess severity of liver disease **Treatment** • Perform diagnostic and therapeutic paracentesis • Dose adjust hepatically cleared medications and avoid hepatotoxins • Identify and manage complications of cirrhosis

Continuum of Care

Continuum of care – from diagnosis, referral, and linkage to care to retention in care, and referrals, both for treatment of acute complications and to long-term chronic care management – is critically important for patients with severe, complex NCDs. The PEN-Plus clinic can serve as the fulcrum for continuum of care for these patients.

Active Case Finding, Diagnosis, and Linkage to Care

It can be challenging to identify and diagnose patients with NCDs, because they are often asymptomatic for years before showing signs or symptoms of disease. Even patients with severe NCDs, such as type 1 diabetes, rheumatic heart disease, sickle cell disease, and chronic liver disease, often go undiagnosed until an acute crisis brings them to the hospital emergency department or inpatient ward. These delays in diagnosis can lead to severe, sometimes irreversible, complications including renal failure, heart failure, and blindness. Therefore, it is important to diagnose patients early to initiate directed treatment and avoid long term complications.

Active case finding is a strategy to identify previously undiagnosed patients living with disease in the community. Screening for common NCD conditions such as hypertension and type 2 diabetes can play an important role in identifying patients and initiating treatment before their conditions progress and they develop disabling or life-threatening complications. Screening can also provide an opportunity for health center staff to identify cases that warrant further evaluation for possible diagnosis of a severe NCD and to arrange for appropriate follow-up studies.

Screening for severe NCDs is more complicated, as – unlike diabetes or hypertension – there often is not a simple, straightforward screening tool to use in the communities and primary care settings to identify these conditions. Some of these conditions require more sophisticated clinical evaluation, and many of these conditions are less prevalent. There is therefore no clear consensus yet regarding the utility of systematic screening for severe NCDs, such as type 1 diabetes and rheumatic heart disease, that are relatively rare. The MOH will continue to explore its value and pilot as appropriate. For exxample, screening infants for sickle cell anemia will be explored in order to identify these children as early as possible. In the absence of screening, the PEN-Plus clinic can strengthen capacity for early diagnosis by

training primary care providers at health centers to recognize possible symptoms or exam findings and refer patients to the clinic, where staff have the specialized training and tools needed to confirm a diagnosis and initiate treatment.

The pilot PEN Plus clinics in Neno have explored leveraging existing community efforts, such as Community Health Workers, to identify what may be early symptoms of these severe NCDs. In an iterative fashion, the team has been adding basic symptom screening to the CHW work in Neno, where ~1,200 CHWs support the HSAs to identify, refer, and link patients to care.[12,13] These CHWs cover every household in Neno, so the potential for symptom screening is significant. As of December 2020, these questions have been used in the catchment area of 3 health centers in Neno, prompting referral on specific days to the nearest health center, when the PEN Plus team is available for detailed evaluation. They have also been included in a pilot project with mHealth for the CHWs; ongoing evaluation will examine their utility.

Table 5. Symptom screening for severe NCDs

Possible symptom-screening questions for severe NCDs	
English	**Chichewa**
Do you get really short of breath walking uphill?	Kodi mumamva kubanika kapena kuchita phuma kwambiri pamene mukuyenda mokwezeka mtunda?
Are you unable to sleep when you lie down flat because you feel short of breath?	Kodi mumakanika kugona tulo chifukwa choti mukubanika pamene muli chigonere?
Do you have severe swelling in your feet or ankles?	Kodi mapazi kapena molumikiza miyendo ndi mapazi anu ndi motupa kwambiri?
For any individual in the household under age 40 who is not pregnant: does anyone have to get up more than two times at night to urinate?	Kwa munthu wina aliyense opezeka m'banjamo amene ali wa zaka zochepera 40 komanso siwoyembekezera: Kodi alipo amene amadzuka kukakodza usiku kopitilira kawiri?
Does anyone in the household sometimes have fits, become rigid, or lose consciousness?	Kodi alipo nyumba ino amene amadwala matenda okugwa. kapena okomokakomoka?
Are you unable to sleep when you lie down flat because you feel short of breath or do you have to pile up clothes and pillows to sleep with comfort?"	Kodi mumavutika kapena kubanika mukagona malo a flat, Moti kuti mugone bwino mumadalira kugonera mulu wa zovala kapena pilo?
Do you have swelling in your abdomen, meaning your whole belly is getting bigger and belts or pants are not fitting anymore?	Kodi muli ndi chotupa m'mimba mwanu monena kuti mimba yanu yonse yakula kwambiri moti lamba kapena thalauza sizikukukwananinso?
This is for people under 40 years old looking for a condition that does not occur in older people. If you are under age 40 years, are you experiencing both of the following things: urinating more than 4 times overnight and having excessive thirst, meaning you are drinking much more water all the time than you used to?	Ndondomeko iyi ndi yofufuzira zizindikiro kwa anthu amene zaka zawo ndi zosaposera 40. Ngati zaka zanu zili zosaposera 40, kodi mukukumana ndi zizindikiro ziwiri izi? Choyamba, kukoza koposera kanayi usiku umodzi? Chachiwiri, kumva ludzu losatha zomwe zikukupangitsani kumwa madzi pafupipafupi kusiyana ndi kale lonse?

Linkage to care is important to make sure patients who are diagnosed with NCDs or require further evaluation are able to follow up in clinics. Districts must develop strategies to make sure severe NCD patients are linked to PEN-Plus clinics from outpatient departments, screening events, health centers, HIV/NCD primary care clinics, and inpatient admissions. Using health passports to link patients to care are commonly used, but districts will consider electronic linkage and referral systems. At a community level, utilizing Community Health Workers (CHWs) and Health Surveillance Assistants (HSAs) are positioned to help accompany patients to visits can improve linkage and follow up.

Retention in care and social support

Once patients with severe NCDs have been diagnosed and initiated on treatment, maximizing retention in care is essential to achieving successful outcomes. The PEN-Plus clinic model includes several components designed to monitor and support retention in care. A robust Monitoring and Evaluation (M&E) system enables clinic staff to identify patients who miss appointments or are lost to follow-up. This missed visit tracking system can deploy HSAs and/or CHWs to then follow up with patients and accompany them to the clinics. In addition, regular patient education can teach the importance of follow up and reduce patients being lost to follow up.

Breaking down barriers for patients is also critical to maximizing retention in care. One barrier is often distance and geography, with long travel times to clinic. The decentralization of care for severe NCDs from referral hospitals to district hospitals is a first step in addressing this challenge. In the future, PEN Plus teams at district hospitals could also consider mobile outreach efforts to health centers, particularly those that may be either far from the district hospital and/or home to a high number of patients.

Patients also experience several social and economic hardships which can present challenges in attending clinic visits and remaining in care. Social support therefore can also be a key both to retention in care and the efficacy of treatment for patients with severe NCDs. Patients with type 1 diabetes (T1D), for example, cannot manage their insulin without regular access to food. And patients with conditions that require regular chronic care visits for clinical consultations and to obtain medications may be unable to walk to clinics or simply live too far away to attend regular appointments.

With additional funding, district PEN-Plus programs will help provide patients who need assistance with food packages, housing, cash transfers and/or transport vouchers. This social support will include food or cash transfers to patients with T1D, so they can safely have three meals per day and manage their insulin, and transport fees or reimbursements for patients who face physical and financial barriers to attending regular appointments. NCD social workers will help organize and distribute social support.

Bridging a Gap in Referral Pathways and Chronic Care Delivery

PEN-Plus clinics at district hospitals fill critical gaps in referral pathways and chronic care services for patients with severe NCDs. PEN-Plus clinics can take referrals from all levels of the health system – health centers, district hospital inpatient departments, and specialty departments at referral hospitals – for patients with conditions that require complex chronic care services. And district PEN-Plus clinics also refer patients to both higher and lower levels of the health system, either to treat severe complications (at referral hospitals) or to maintain chronic care for conditions that are under control (at health centers). (See Figures 2 & 3)

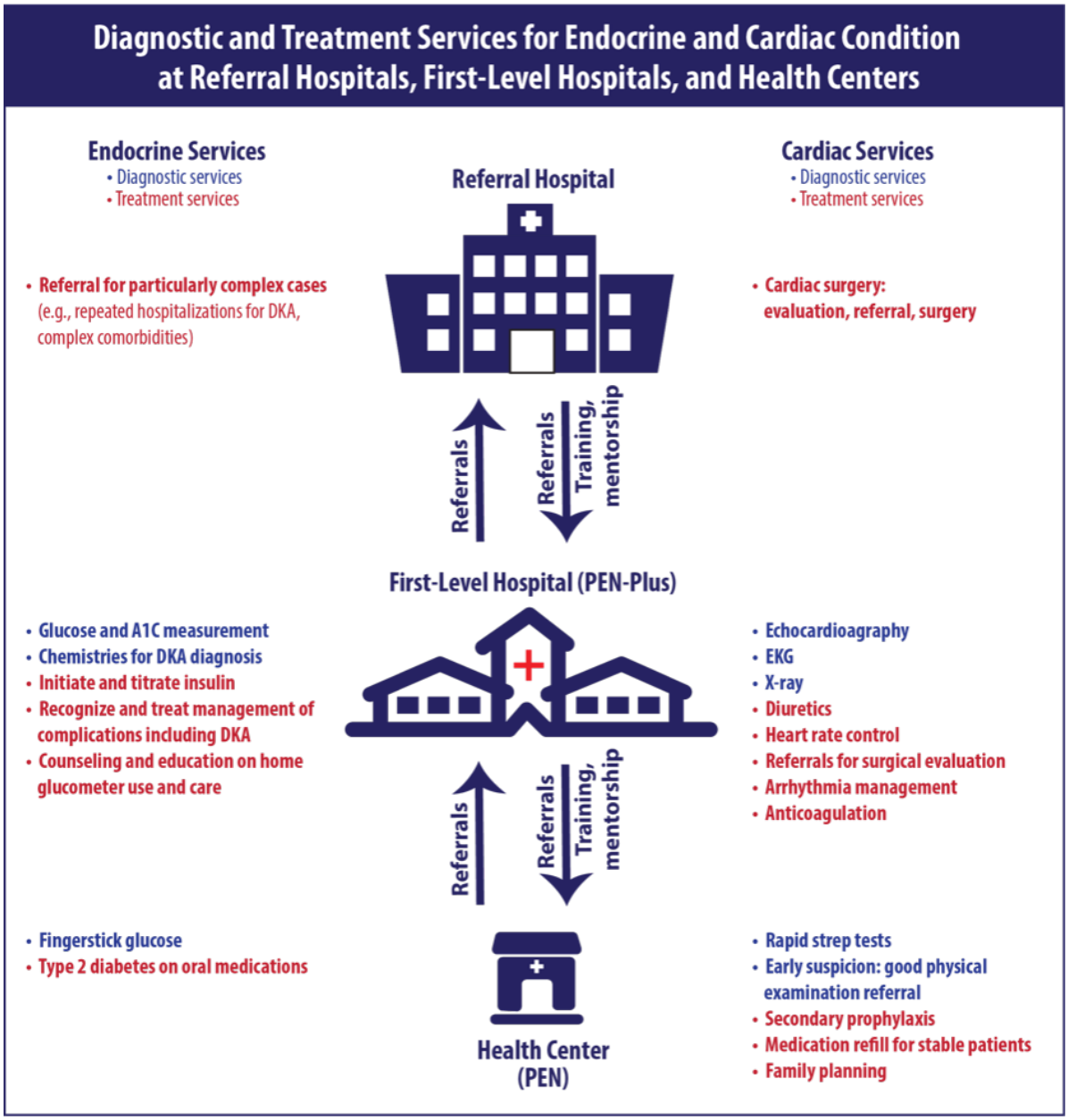

Figure 2. Cascade of Care example

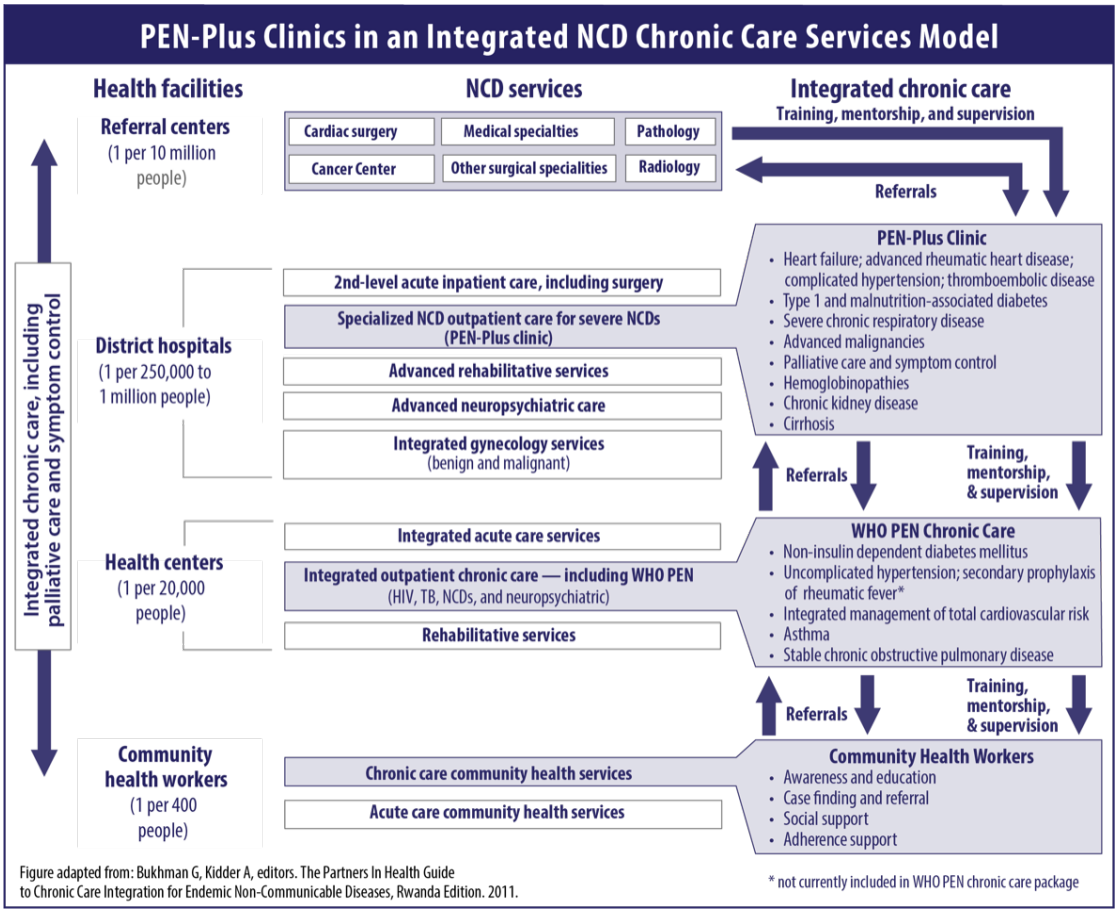

Figure 3. PEN-Plus clinical model

Referral hospitals can provide specialized outpatient and inpatient services that may be necessary for acute and chronic complications of severe NCDs. In these circumstances, PEN-Plus clinics will refer patients to higher levels of care. For patients who must be referred to tertiary care facilities for surgery and other specialized treatment, the PEN-Plus clinic will provide essential post-operative chronic care services – such as anti-coagulation and echocardiography for RHD patients following valve surgery – to manage and monitor patients closer to their homes.

Staffing & Training – Filling the Human Resources Gap

Staffing

Human resources can be a major challenge at district hospitals, including for NCD care. Additionally, unlike their chronic care counterparts in Mental Health and Palliative Care, the clinical staff (clinical officers or nurses) who coordinate the NCD programs receive no additional formal training or degree. Many NCD coordinators are rotated out of the position quickly which makes it difficult to establish services in the district. There are often few resources, including mentorship, training, dedicated space, essential medicines, and equipment, available to support the NCD clinical staff. In order to improve NCD care in Malawi, it is necessary to significantly enhance our human resources by establishing formal training and certification for NCD specialists.

PEN-Plus clinics address this gap by establishing a cadre of mid-level providers – clinical officers and nurses – with specialized training in diagnosis and treatment of severe NCDs. Skills acquired by these specialized NCD clinicians include simple echocardiography for diagnosis and monitoring of rheumatic heart disease, as well as interpretation of laboratory testing and monitoring and adjustment of medications with narrow therapeutic windows (such as insulin and warfarin). This specialized training enables these mid-level providers to staff the PEN-Plus clinic, with oversight from a physician, and to provide mentorship and supervision for staff who provide PEN services at health centers.

Each district will have the following members of an integrated PEN-Plus team:

- **NCD Clinical Officer**: The NCD Clinical Officer will be the primary clinical care provider at district PEN-Plus clinics, interpreting diagnostic tests, doing history and physical examination, and prescribing medications. Additionally, the NCD Clinical Officer will consult on inpatients with severe NCDs in the hospital. The NCD Clinical Officers will be responsible for mentoring NCD care at health centers and receiving referrals from other levels of care.
- **NCD Nurse**: The NCD Nurse will work as a core part of the clinical team in district PEN-Plus clinics, providing counseling, education, and basic patient care. The nurse will assist with inpatient consultations and provide education to patients admitted with severe NCDs. NCD nurses will help with mentoring at health centers and providing community outreach services.
- **NCD Data Clerk**: The NCD Data Clerk will manage patient files, documentation, and DHIS2 reporting. He/she will flag files when needed to indicate lab results, missed appointments, and patient outcome.
- **NCD Social Worker**: The NCD Social Worker will help screen patients for socioeconomic and other vulnerabilities. He/she will help organize and lead home visits. The NCD Social worker can help with counseling and link patients to other services (e.g., palliative care).

It is important that NCD specialists are kept in the above roles and not rotated through other programs in the district. In order to improve NCD care at the district level, PEN-Plus will require clinicians who are specialized in and dedicated to their field.

Table 6. Specialized Skills for PEN-Plus

Specialized Skills of PEN-Plus Clinical Officers and Nurses	
Disease system	**Specific Skills**
Multi-specialty	proficiency with diagnostic and treatment protocols; palliative care and symptom control; counselling regarding home-based care; training, mentorship, and supervision of health center staff and community health workers
Endocrine	proficiency in insulin management; screening for complications of diabetes
Cardiovascular, Renal, and Gastrointestinal	capability to perform and interpret simplified echocardiography, abdominal ultrasound, and electrocardiography; ability to interpret basic chemistries; skill in management of heart failure medications and anticoagulants
Pulmonary	capability with peak flow meters, inhalers, spacers, nebulizers
Palliative Care	proficiency in morphine management, psychosocial counseling techniques

Training and Mentorship

Establishing and sustaining a skilled work force to manage PEN-Plus clinic patients will require training and mentorship that is specific to severe NCDs. The training will also have to be detailed, longitudinal, and paired with ongoing clinical mentorship. As a way to meet these requirements and provide training opportunities across the entire country, facilities across Malawi with well-established PEN-Plus clinics will serve as regional PEN-Plus training centers. It is important that the training centers be established in rural districts so trainees learn how to treat NCDs in the setting in which they will be working. It will also be necessary to identify appropriate in-country partners, including licensing boards, academic institutions, and non-governmental organizations in the development of training centers.

Neno District is well positioned to be the first training center because of its early establishment of PEN-Plus clinics in 2018 and work with national stakeholders. Subsequently, Karonga in the northern region and Salima in the central region will adapt the Neno experience and establish district PEN-Plus clinics and regional training centers. Coordinating this national PEN-Plus training effort will require dedicated MOH staff to work with partners and establish core curricula, pedagogy, training materials and tools, and monitoring and evaluation systems. The training components will be based on meeting a standardized list of PEN-Plus competencies.

Clear lines of communication between districts and national leadership, including the Deputy Director of NCDs and all NCD Technical Advisors, will be necessary to support PEN-Plus training programs. Specifically, it is important that there is adequate guidance and support to the district-based team members, including District Health Officers (DHOs), District Medical Officers (DMOs) and District Nursing Officers (DNOs), who are leading PEN-Plus training centers.

PEN-Plus initial training will last 4 to 8 weeks, depending on the volume of trainees, will be on site at a PEN-Plus training center for the duration, and will consist of the following:

- **Trainees**: Clinical officers and nurses will be the first mid-level providers chosen to attend a PEN-Plus training program. Ideally, multiple mid-level providers from a district will not attend at the same time in order to avoid putting strains on NCD care in districts and allow multiple districts to have trainees in each session.
- **Trainers**: Specialist physicians (e.g., internists, pediatricians, cardiologists, endocrinologists) will either provide direct training or lead a Training of Trainers, in which case the trainees would be general practitioners or clinical officers. PEN-Plus initial training will also incorporate e-learning where necessary and possible, in order to incorporate all of the requisite clinical specialties.
- **Didactic teaching sessions**: Didactic sessions will include a combination of clinical lectures, case presentations, and strategies on counseling patients. Topics include all of the conditions and interventions as defined in the PEN-Plus package. Didactic sessions will take approximately 40-50 hours to complete. Developed didactics in use in Neno District can be seen in Appendix 4.
- **Practical training**: Trainees will spend time observing clinicians as well as evaluating patients with guided mentorship at NCD and PEN-Plus clinics. Trainees will also observe and learn the day-to-day operations and management of the PEN-Plus clinic over the duration of the 4-to-8-week initial training.
- **Health Centers**: Trainees will visit NCD clinics at health care centers as to observe and practice mentorship activities with the primary care providers.

- **Assessments**: Trainees will be required to pass written and practical assessments addressing all of the prioritized severe NCD conditions cared for in the PEN-Plus clinics.
- **Certification and follow-up education**: Trainees who complete the training with satisfactory scores regarding knowledge and clinical skills will receive a certificate in PEN-Plus / Advanced NCD chronic care. The significance of this certificate and future opportunities for specialized training will be discussed with academic and licensing boards. In the future, NCD specialization will be recognized and incentivized as to meet and maintain staffing needs. Yearly refresher trainings will be provided for NCD specialists. Additionally, an on-site mentorship program will be designed and implemented such that each PEN-Plus clinic receives directly observed mentorship and guidance at least once per quarter.

Medications & Supplies

Just as the PEN-Plus clinic fills gaps in service delivery, the continuum of care, and human resources, it also addresses the gap in availability of essential medications and supplies for diagnosis and treatment of NCDs at primary and secondary levels of the health system and in rural areas.

PEN-Plus clinics rely on a basic package of equipment, supplies, and medications. Based on the interventions included in the PEN-Plus package as well as experience from Neno clinics, the consultation group convened by MOHP has defined a list of medications and supplies required for implementation. Equipment essential to PEN-Plus includes radiologic modalities, such as x-ray and ultrasound, and laboratory devices for performing multiple tests such as hemoglobin, creatinine, chemistries, HIV, and blood glucose. Most of the required medications are inexpensive, available as generics, and included on WHO's essential medicines list.

In addition, the Stakeholder Consultation Group has undertaken an assessment of the baseline availability of these materials, whether they are currently included on essential medicine lists at district hospital level, and whether they are procured by the Central Medical Stores Trust (CMST), based on analysis of the quantification process initiated by the Ministry of Health through the Health Technical Support Services Directorate.

Medications

All of the medications defined as essential for PEN-Plus appear in the Malawi Standard Treatment Guidelines and the Malawi National Essential Medicines List 2015. This can be attributed to the adoption of the WHO-PEN and the routine data collection of drug usage through the Logistics Management Information System (LMIS). The assessment found, however, that only 62% of the medications required for PEN-Plus services are procured by CMST and classified as "must have" medicines at the district hospital level. (Table 7) Another 22% of the PEN-Plus medications are currently procured in large quantities at district hospitals, even though they are not classified as essential at that level, while the remaining 16% of PEN-Plus drugs are currently procured only through the Central Hospitals.

To support delivery of PEN-Plus services, drugs not currently included on the district hospital "must have" list will need to be added by working with the Ministry of Health Drug Committee, which is responsible for prioritizing drugs based on the needs and conditions seen at respective health delivery centers.

Table 7. PEN-Plus medications on district hospital list[14]

PEN-Plus Medications on and Not On the CMST "Must Have" List for District Hospitals		
PEN-Plus Proposed Medications	**Medications on CMST "Must Have" List for District Hospitals**	**Medications Not on CMST "Must Have" List for District Hospitals**
HCTZ	X	
Amlodipine	X	
Nifedipine (optional)	X	
Enalapril	X	
Atenolol	X	
Bisoprolol (optional)		X
Methyldopa	X	
Hydralazine (po and IV)	X	
Spironolactone	X	
Furosemide	X	
Aspirin	X	
Simvastatin	X	
Metformin	X	
Glibenclamide		X
Actrapid/Regular insulin	X	
Insulintard/NPH insulin	X	
Salbutamol	X	
Beclomethasone		X
Prednisolone		X
Aminophylline	X	
Benzathine Penicillin (IM)		X
Heparin (IM)		X
Warfarin		X
Omeprazole	X	
Lactulose		X
Hydroxyurea		X
Folic Acid	X	
Sulfadoxine-Pyrimethamine		X
Amitriptyline	X	
Paracetamol	X	
Ibuprofen (Bufen)	X	

Supplies

Unlike medications, a review of supplies that are readily available at district level and also included in the 2020 quantification exercise reveals that many of the supplies proposed for PEN-Plus are not currently included on the essential list of supplies for district level care. Key PEN-Plus supplies that are not on the essential list include: ultrasound machines; pulse oximeters; point-of-care chemistry machines (e.g. iSTAT) and reagents for chemical testing; HbA1C machines; glucometers; and glucose test strips.

Table 8. PEN-Plus supplies on district hospital list[14]

PEN-Plus Supplies on and NOT On the Essential List of Supplies for District Level Care of NCDs		
PEN-Plus proposed supplies	**Supplies ON the essential list**	**Supplies NOT on the essential list**
Ultrasound Machine		X
Ultrasound probes (adult and pediatric cardiac, abdominal)		X
Ultrasound Gel		X
Pulse Oximeter		X
Stethoscope	X	
Chemistry testing (e.g. iSTAT)		X
Chemistry reagents (e.g. iSTAT cartridges)		X
HbA1C machine (with or without cartridges, depending on model)		X
Glucometer		X
Glucose Test Strips		X
EKG machine, electrodes	X	
Insulin needles	X	
Lancets	X	
Urine cups	X	
Urine test strips	X	
Rapid HIV test	X	
Alcohol wipes	X	
Red tube tops	X	
5mL and 10mL syringes	X	
Gauze packs	X	
Cotton	X	
Methylated spirit	X	
Tablet bags	X	
Scale		X
Stadiometer (measure height)		X
Thermometer	X	
Blood pressure cuff		X
Sharps box	X	

Implementation and scale-up of PEN-Plus services nationally in Malawi will entail an assessment of the availability of these supplies and medications and their inclusion on essential supply and medicine lists at district hospital level. More broadly, structures will need to be in place to support this supply chain through the existing government system. A stakeholder group working collaboratively across facilities, departments, and ministries will establish an effective governance structure and funding mechanism to support procurement, storage, district ordering, distribution, and monitoring to prevent stockouts and project needs for all essential supplies and medications.

At a March 2020 meeting of the Stakeholder Consultation Group, a working group led by a representative of the Central Medical Stores Trust (CMST) presented three options for procurement, management, and distribution of NCD drugs. Under their preferred option, the group recommended establishing and funding an independent NCD procurement unit, consisting of a procurement officer and a three- or four-person supply chain team. Reporting to the MOHP Deputy Director of NCDs, this unit would procure NCD

drugs internationally, clear them into the country, and deliver them to CMST, which would be responsible for warehousing and distribution to hospitals and health centers. A second option would also create an NCD procurement unit, but in this case the unit would not procure materials internationally. Instead, it would quantify what drugs and supplies were needed and would then place orders with CMST to purchase, store, and distribute them. Both of the preferred options would include establishing a separate, specialized NCD procurement unit to work in collaboration with CMST.

Accompanying the central procurement and distribution system is a critical need for district level support and mentorship on NCD commodities. As many of the services, and therefore commodities, may be new to district hospitals, PEN-Plus implementation will include mentorship and technical support for district leadership and pharmacy teams. This will include the quantification (particularly for new clinics where the number of new patients must be estimated), monitoring, drug interactions, and documentation. The district PEN-Plus teams will be closely linked to pharmacy teams, with dedicated NCD pharmacy technicians wherever possible.

Pen-Plus Monitoring & Evaluation

National Data Systems

Successful implementation and scale-up of PEN-Plus will require a robust Monitoring and Evaluation (M&E) system to collect, aggregate, and analyze patient, facility, district, and program data. This data will be used to guide program design and implementation, identify areas for improvement and intervention, share results with clinic, district, and national leadership, monitor impact, and inform policy and budget decisions.

In order to position the PEN-Plus M&E plan for success and encourage high data quality and routine use, it will be situated within the existing health data system in Malawi. Several strides have already been made toward this goal.

The Ministry of Health uses a comprehensive and integrated Health Management Information System (HMIS) to collect and report on routine health services and disease data. The HMIS is the nationally recognized reporting mechanism intended for all of the health programs currently rolled out in all district hospitals and cascade addition of health facilities in Malawi with the exception of HIV. One major component of the HMIS is the District Health Information Software (DHIS2). This software is used to harmonize reports from different programmatic areas. The DHIS2 is the central data repository, which aggregates routine health management information data emanating from health facilities.

NCD Indicators & Data Tools

The NCD program released an indicator handbook in 2019. The indicator handbook covers an initial set of prioritized NCDs and mental health conditions. These conditions include PEN primary care conditions (hypertension, type 2 diabetes, asthma, COPD) as well as epilepsy and then mental health indicators as a group. Additionally, this initial set of indicators split diabetes into type 1 and type 2, making Type 1 diabetes the principal PEN-Plus condition included in the existing NCD M&E system. The indicators included in the handbook cover the continuum of care including numbers enrolled, numbers defaulted or died, and some basic clinical outcomes. (See Appendix 5 for a table of indicators included in the NCD program's indicator handbook.)

As part of the process to develop the indicators, essential data collection tools were developed that would be used in the collection of data and the data reporting forms reported on quarterly basis. These include the following:

1) an NCD Register, which allows for clinics to indicate a patient's diagnosis and if they have an 'Advanced NCD', meaning they are appropriate for PEN-Plus (See Appendix 8)
2) NCD 'Master Cards', which are one-page individual patient records to track each visit and key clinical parameters. The Master Card approach is based on the HIV data system in Malawi and current nationally approved Master Cards are included in this list, with draft PEN-Plus Master Cards being piloted in Neno for Chronic Heart Disease, Chronic Kidney Disease, and Other (See Appendix 6)

Table 9. NCD Master Cards

NCD Master Cards	
Nationally approved and in circulation	**PEN-Plus pilot Master Cards, in use in Neno**
• Hypertension & Diabetes • Chronic Lung Disease • Epilepsy • Mental Health	• Chronic Heart Disease • Chronic Kidney Disease • NCD Other

3) NCD Quarterly Data Reporting Form, on which facility and district staff can aggregate results to be entered into DHIS2, which produces the national indicators on a quarterly basis (See Appendix 7)
4) A set of training materials for NCD data clerks and other staff to utilize the NCD data tools

NCD Data System Challenges & Way Forward

Although the current NCD data system, which uses HMIS and DHIS2, represents a major advance for collecting and reporting health data, some weaknesses have been observed. This includes the existence of parallel reporting systems for certain NCDs that are not yet in the national data system or may have specific funding streams and programming supporting them, such as cancer conditions or mental health. This existence of multiple systems creates practical challenges for reporting, can influence data quality, and can weaken the primary MOH M&E system in DHIS2.

A second challenge is data quality. This comes from a myriad of factors including training and mentorship needs, challenges in recording data at the patient care as well as facility level, errors in data extraction and aggregation through the manual paper-based system, and limited human resources to devote time to data quality activities. Data quality there remains poor in some regions, and data reporting is often not submitted on time.

A third challenge is meaningful use of the data. This is influenced when data quality is poor and/or reporting is not timely. In addition, end users at the facilities and at the district level require training, mentorship, and support in data interpretation, analysis, and application. Fortunately, early experience suggests that intervening in this area along with the data system may improve ownership and therefore data quality.

The PEN-Plus initiative can help address some of these system challenges in the NCD M&E system in Malawi. This can be achieved by incorporating data system training into the NCD training and following it up with ongoing on-site mentorship. In addition, the PEN-Plus team can work with clinical and district leadership to review NCD data every month in the district, instilling data ownership and planning in the local teams.

In addition to strengthening the data system, the NCD M&E plan will need to be expanded to incorporate PEN-Plus conditions that will be monitored. By leveraging the existing systems and expanding them to include PEN-Plus activities, the performance of the PEN-Plus clinics can be monitored and systems improved in an ongoing way.

Monitoring the implementation of the PEN-Plus operational plan

The information below describes how stakeholders will monitor the implementation of PEN-Plus and determine whether the objectives are being met.

Specifically, monitoring for the PEN-Plus operational plan has the following objectives:

- To allow MOHP and partners to work more effectively and efficiently towards achieving the Pen-Plus goals and objectives in Malawi.
- Provides feedback mechanism on core inputs to PEN-Plus success such as human resource personnel available.
- To identify knowledge exchange platforms to provide relevant information locally and globally.
- Provide the necessary supply chain monitoring for drugs and consumables, broken down by disease

Table 10. Monitoring the implementation of PEN-Plus

	PROJECT SUMMARY	INDICATORS	MEANS OF VERIFICATION	RISKS / ASSUMPTIONS
OBJECTIVE 1	**To staff district hospitals to provide high quality care for patients with severe NCDs**			
Outcomes	Increased availability of specialized medical personnel focusing on NCDs at first-level hospitals	• % of district hospitals with staff trained in severe NCDs • % of trained staff meeting thresholds on mentorship scores in NCD care	• HR quarterly reports • Mentor reports	Staff turnover
Outputs	Medical personnel trained in specialized NCD	Number of mid-level providers trained in severe NCDs	• Training reports	
	Patients receiving NCD specialized care through the NCD clinics	Number of patients accessing and receiving NCD specialized care at PEN-Plus clinics	• DHIS2 • Patient Master Cards • Clinical case reviews	Availability of equipment and supplies
OBJECTIVE 2	**To ensure availability of PEN-Plus essential medical equipment, drugs, and commodities to promote quality of care for patients in screening, diagnosis and management**			
Outcomes	Increased availability of PEN-Plus medical equipment, drugs, and commodities.	• % of NCD patients accessing diagnostic and laboratory results in PEN-Plus clinics • % of Pen-Plus clinics with all required medical equipment and supplies	• Patient Master Cards • Facility based reports	• Funding • Reliable central procurement mechanism • Efficient distribution system • Secure storage • Technical capacity of hospital staff
Outputs	Equipment and supplies guidelines available for stock tracking	Number of PEN-Plus sites provided with equipment and supplies guidelines	• Facility based reports	
	Screening and diagnostic materials procured and distributed to all PEN-Plus clinics	Number of PEN-Plus facilities that received screening and diagnostic materials	• Supply and Logistics reports	
OBJECTIVE 3	**To strengthen the M&E system to ensure programmatic monitoring of PEN-Plus clinics**			

	PROJECT SUMMARY	INDICATORS	MEANS OF VERIFICATION	RISKS / ASSUMPTIONS
Outcomes	Improved program level monitoring for PEN-Plus	• % of PEN-Plus clinics submitting quarterly data • % of PEN-Plus clinics that hold quarterly data review meetings	• DHIS2 • Master Cards • Facility & Mentor reports	Health workers and trained staff able to use the M&E tools and equipment consistently
Outputs	Existing NCD DHIS2 sites strengthen and maintained	Number of existing NCDs DHIS2 sites that are operational and receiving support	• DHIS2 utilization online and reporting rates.	

How to Get There

This section explores phased implementation, specifically highlighting steps and processes to pursue during the second phase 2021-2023.

Table 11. PEN-Plus phases of implementation

PEN-Plus Phases of Implementation		
Phase I	2018-2020	Planning, initial training site development, and initiation • Situational analysis • Stakeholder engagement • Planning meetings • Pilot implementation and evaluation (Neno District)
Phase II	2021-2023	Implementation and scale up • Planning meetings • Stakeholder engagement • Resource mobilization • Stepwise scaleup of PEN-Plus to district hospitals • Initiation of 2 additional training sites
Phase III	2023-2030	Ongoing scale up and evaluation

Governance

The second – and critical – phase of PEN-Plus national scale up involves laying the foundation for national scale-up through a clear governance structure led by the MOHP. The evolution of PEN-Plus planning has benefited from MOHP leadership and a wide variety of stakeholders including interdisciplinary MOHP collaborators across several directorates and programs, implementing partners, academic institutions, civil society, wide-ranging clinical specialists, central hospitals, and funders. Contributing forms thus far include the following:

1) Malawi NCDI Poverty Commission[8]: Starting in 2016, the NCD Unit at MOHP led a group of stakeholders in Malawi in a national-level review and recommendation process. Supported by the global *Lancet* NCDI Poverty Commission[15], the Malawi Commission focused on the burden of NCDs and injuries (NCDIs) in Malawi and underwent a rigorous priority-setting process. This identified conditions and NCDI interventions for prioritization in Malawi's health system. After the launch of the Commission report in 2018, the majority of Commissioners continued on to be part of the stakeholder consultation group (see below).
2) Pen-Plus Stakeholder Consultation Group: This grew organically from Malawi's Commission and expanded to a wide audience of stakeholders who came together for the first time in 2019 to draft this operational plan.

Moving forward, the NCD Unit at the MOHP, led by the Deputy Director of Clinical Services for NCDs & Mental Health, will chair a PEN-Plus Steering Committee.

The membership of the Steering Committee will include key MOH leaders and technical experts, implementing partners specifically caring for patients with NCDs and those supporting the PEN-Plus training sites, core NCD funders, representatives from academic institutions in Malawi, and civil society representatives. This group will convene quarterly, in person or virtually, with the following objectives:

- To review progress in implementation, compared to the PEN-Plus operational plan and the corresponding monitoring framework that supports the plan (see preceding section)
- To review national NCD indicators and measure progress in PEN-Plus enrollment and clinical outcomes
- To discuss core challenges and barriers encountered during implementation and explore solutions
- To discuss existing and potential funding sources and progress toward resource needs
- To derive data and experience to share with government leaders, funders, civil society, and advocacy organizations

Clinical Implementation and continuum of care

A core objective during the early implementation from 2021-2023 is to strengthen the model of delivery of PEN-Plus services, with attention to the entire continuum of care, need for human resource development, and best avenues to support vulnerable patients and their families.

Defining the PEN-Plus package

The initial PEN-Plus package has been defined in this operational plan, specifically regarding clinical conditions and interventions for the PEN-Plus district hospital sites. This is meant to act as a set of services for the early to medium term. Next steps include to operationalize and monitor these services at the existing PEN-Plus sites and the proposed PEN-Plus training sites. In addition, the package should be optimized over the first few years in order to include all key conditions and interventions, mapping those onto training, mentorship, and supply chain efforts.

Linkage to care and referral networks

Referral to PEN-Plus clinics will occur from several levels of care. The first task of the PEN-Plus team(s) will be to map the logistics, tools, support, and monitoring processes for all of these levels. The table shows

the possible sources of referrals to PEN-Plus clinics with associated tools and trainings that will be developed in Phase II.

Table 12. Linkage to Care and Referral Networks

Sources of Referral	Process to be developed in Phase II	Tools	Training & Mentorship
Inpatient wards	Interdisciplinary inpatient rounds with PEN-Plus team; Referral mechanism to outpatient PEN-Plus clinic	• Clinical template for rounds • Referral form to PEN-Plus • Discharge instructions	Inpatients teams on PEN-Plus clinic, team, conditions treated, inpatient management and referral
General OPD HIV clinics TB clinics Maternal Health <5 clinic	Referral mechanism to PEN-Plus; District hospital / on site: consultation process when possible PEN-Plus patients are identified; Clinical algorithms for screening for severe NCDs (e.g. sickle cell screening in infants)	• Referral form to PEN-Plus	Outpatient teams on PEN-Plus clinic, team, conditions treated, how to screen/refer
Community	Symptom-based screening for clinical evaluation; Referral mechanisms; Approach to home-based management	• Symptom-based screening questions • Community and home education materials	HSAs, CHWs, other community staff on PEN-Plus clinic, screening questions, referral, home management
Central Hospitals	Communication/referral back to PEN-Plus team; Specific clinical criteria for escalations		Central hospital staff introduction to PEN-Plus clinics/teams

Similarly, the PEN-Plus clinics will refer both to higher and lower levels of the health system. Patients with severe complications will be referred to central hospitals for specialized procedures such as surgery and chemotherapy for pediatric and women's cancers, retinopathy, laser treatment for diabetic retinopathy, and cardiac surgery for advanced rheumatic and congenital heart disease. Patients whose symptoms and conditions have been stabilized will be referred to health centers for ongoing case management and monitoring, with support and mentorship from the PEN-Plus clinic staff.

Once patients are enrolled into PEN-Plus, efforts to maximize retention in care will mirror these efforts to streamlining screening, referral, and linkage to care. Core to this will be developing and utilizing strong approaches to patient education for patients and their families. Additionally, the following mechanisms will be deployed and systematized during Phase II:

1. Missed visit tracking: This will rely on reports from clinic registers and Master Cards. Systems will benefit from integration with HIV and other missed visit tracking systems in place in districts.
2. Phone calls to patients: where possible, when patients have phones, clinic staff can call them to check on them and help them return to clinic
3. Home visits: these will be core to clinical care and management. PEN-Plus staff will do home visits routinely in order to understand and address specific socioeconomic circumstances and barriers that patients face. Home visits will particularly help for patients that have missed visits or defaulted from care and/or that may benefit from additional support and education in the home.
4. Social support: wherever funding available, means of social support will help patients overcome barriers to clinic attendance and treatment adherence. (See below)

Social support

Each PEN-Plus clinic will have at least one NCD Social Worker. This person(s) will work to screen patients for socioeconomic factors and vulnerabilities, and Phase II will develop the socioeconomic screening tools for these questions and an initial way to quantify vulnerability. This tool and score will need to be iterated on in an ongoing way as DHS and other datasets can help guide the most pertinent questions. The NCD Social Worker(s) will also own the home visit part of the Pen-Plus program. Phase II will include development of any forms or tools for home visits as well as guidelines and approaches for home-based education and home-based management. This initial phase will also entail the social worker liaising with key related clinical programs, such as Palliative Care, to develop formal approaches to joint patient management and follow up. Lastly, Phase II will work to describe and quantify socioeconomic needs in the enrolled PEN-Plus population in order to advocate for need, quantify budgetary inputs, and incorporate social support into the M&E system.

Infrastructure

PEN-plus hospital sites will need an assessment of physical infrastructure to ensure adequate and dignified space is available to house the PEN-Plus staff. Initial assessment will include attention to clinic space, waiting areas, medication/equipment storage, electricity, running water, and cleaning/ maintenance capacity. Wherever possible, existing space will be used and/or renovated for PEN-Plus clinics, and initial assessment will highlight where additional space may be needed.

Staffing & Training

The delivery of integrated care for severe, chronic NCDs as defined in the PEN-Plus package above will require specialized training that has an initial orientation and is paired with ongoing support, refreshers, and mentorship. It will also need to be tailored for each clinical cadre working in the PEN-Plus clinic. The training efforts must be of high quality, supported by mentorship, and evaluated and updated routinely in order to support a large, decentralized workforce to the first level hospitals.

Refining the curriculum

Initial curriculum for PEN-Plus exists through the pilot clinics in Neno District, with didactic and other materials covering a range of the PEN-Plus conditions. During Phase II, these materials will be reviewed, edited, and supplemented with additional training curriculum. Particular attention will be paid to mentorship materials and checklists as well as evaluation of clinical skills of PEN-Plus trainees (written and practical). Each staff cadre will have a unique training curriculum focused on their scope of work.

PEN-Plus curriculum, initially designed for in-person didactics, mentorship, and skills sessions, will also be adapted for an eLearning platform for applicable materials in order to enable initial and ongoing remote support. eLearning may be particularly well positioned to provide ongoing support to remote districts once PEN-Plus trainees undergo initial training and/or support clinical training by clinical specialists not located on site.

Training Sites

During Phase II, two regional training sites will be launched, in Salima and Karonga, meaning there will be 1 per region in Malawi (southern, central, and northern). Staff at these sites will undergo all PEN-Plus training and additionally be trained to act as teachers and mentors, themselves. The training sites will be closely linked in communication with central hospitals, specifically the specialists at central hospitals. The specialists will travel to the training sites on a routine basis in order to review complex cases and teach and mentor on key topics.

Additionally, while operations and strategies deployed at the initial 3 training sites are refined, the PEN-Plus program will be assessed for whether additional training sites are needed. If additional PEN-Plus training sites are indicated, this phase will include planning such as selection of sites, discussion with district leaders, budgeting, and recruiting.

District Hospital Sites

During Phase II, designated clinical staff for PEN-Plus clinics in districts that are not training sites will be hosted by the regional PEN-Plus training site for the initial PEN-Plus training. They will rotate through the training site for 4-6 weeks, allowing for in-depth and in-person teaching and practical training. Phase I aims for each regional training site to train staff from at minimum 4 surrounding districts.

Mentorship Model

The mentorship approach in PEN-Plus occurs at multiple tiers. First, central hospital specialists travel to PEN-Plus sites to see complex cases and mentor clinical staff on a routine basis, with an initial focus on the regional training sites. PEN-Plus implementation will include technical and financial support for sub-specialists, including cardiologists and endocrinologists, in performing this training and mentorship role.

Second, the staff at the regional training sites are positioned as mentors to the districts in their region. Third, the PEN-Plus staff in the districts can serve as mentors to primary care staff at health centers, particularly in the diagnosis and referral of patients with complex NCDs, as well as in the longitudinal management for PEN conditions.

The mentorship approach will center around seeing patients together as a team, with structured debrief afterward. There are existing mentorship checklists for PEN-Plus staff to use when mentoring primary care

staff to care for PEN conditions, and the checklist approach can be expanded to include additional conditions.

The existing WDF program has full time mentors based centrally who travel daily to district hospital clinics to see patients, evaluate systems, and help troubleshoot concerns. This model will continue during Phase II in order to support all sites during scale up, and thereafter these mentors would be based at the regional training sites.

Certification

During Phase II, MOH will work with the College of Medicine and other academic institutions in order to explore possibilities of a formal degree program in clinical management in PEN-Plus clinics. It is possible this could be a standalone degree program for midlevel providers (clinical officers, nurses), or, alternatively, elements of PEN-Plus could be incorporated into existing programs such as the BSC in Internal Medicine at the College of Medicine or at the Malawi College of Health Sciences for the third phase.

Supply chain

Reliable and comprehensive supply of commodities for PEN-Plus will be critical to program success. This effort will rely on collaboration between the NCD Unit at MOHP, Central Medical Stores Trust (CMST), and district leadership, among others. During Phase II the following elements will be pursued:

- Perform an initial analysis focused on quantification of medications and supplies for PEN-Plus regional training sites as well as all routine PEN-Plus clinics. This analysis will also investigate internal procurement prices and mechanisms and make recommendations for monitoring.
- Early in Phase II, the PEN-Plus Steering Committee will review the 3 supply chain options in order to finalize which procurement option to pursue. Thereafter, the infrastructure and staffing to implement this will be put into place. For example, this will likely include an NCD procurement team housed within the NCD Unit.
- Concurrently, the NCD Unit will lead conversations with MOHP and other stakeholders in order to establish procurement systems and a funding mechanism
- An approach with supporting tools will be developed in order to orient and train district leadership, pharmacy, and PEN-Plus staff in ordering and monitoring of PEN-Plus commodities and supplies
- Human resources needed to support supply chain activities will be recruited and trained

Monitoring & Evaluation

During Phase II, training on the existing national NCD M&E system will accompany the clinical training for all PEN-Plus staff. Each district, with PEN-Plus scale up, will be equipped with all NCD M&E materials including registers, master cards, and quarterly reporting form. The mentors (initially based centrally and thereafter at training sites) will mentor on the data tools and system in addition to clinical care.

Furthermore, a routine data sharing practice with PEN-Plus staff and district leadership will be developed and implemented. The existing WDF mentors are piloting a quarterly report for district leadership, combining 1) DHIS2 NCD indicators with interpretation and recommendations; 2) mentorship scores for

district staff with recommendations; and 3) progress reports on PEN-Plus implementation for systems such as pharmacy, equipment, and infrastructure. This system shall be iteratively improved, formalized ,and standardized in order to provide consistent and comprehensive data to district leadership, with aggregate data shared centrally with the PEN-Plus Steering Committee and the NCD Unit. District leadership review of this data will be incorporated into routine district leadership meetings where other clinical programs and data are reviewed.

The M&E system will need expanding, as above, for additional clinical conditions. Phase II will host a needs assessment for what additional data tools are needed, and these will be designed and approved. For example, this may include additional disease master cards in use in Neno on a pilot basis and/or development of new master cards. This process will be done in tandem with a formal review of the national NCD indicators in order to expand the set to include PEN-Plus conditions for reporting from first-level hospitals. Along with indicators, the quarterly reporting form and NCD Register would also need to be updated and approved.

Finally, as discussed in the Continuum of Care section above, additional tools will be required such as tools for inpatient rounds or community referrals. These will be jointly created by clinical and M&E staff in order to derive any necessary data or indicators from all new tools and forms.

Financing

The immediate next step for financing will be to leverage the PEN-Plus Steering Committee experience to define a structure and mechanism for financing. This will build on the experience of multiple existing funded projects including through the World Diabetes Foundation and Helmsley Charitable Trust. Funding for PEN-Plus will pull together interested donors for a range of conditions such as Type 1 Diabetes, Rheumatic Heart Disease, and Sickle Cell Anemia. Malawi will begin Phase II through an exploration of these opportunities, through the following steps:

- Convene a coalition of funders
- Prospectively measure accurate costs and returns on investment
- Identify existing funding streams that may be synergistic, e.g. those focused on PEN-Plus conditions
- Develop a fundraising plan
- Convene with other regional actors in PEN-Plus from countries in the southern Africa region in order to explore regional approaches

Below is a table which estimates the operational costs of initiating and scaling PEN-Plus services across the country to all first-level hospitals. The estimates are based, in-part, on a published PEN-Plus costing study in Rwanda.[16] The study includes: costs at the patient level for outpatient services (including overhead, clinical and support staff, and medications and supplies); one-time start-up investments at the facility level (including construction of clinic space and training facilities, and supplies and equipment); and central ministry of health costs (including a program manager, support for sub-specialists, and referrals for cardiac surgery). Adjustments were made for differences in labor costs between countries, periodic growth in health system infrastructure, as well as inflation.

Table 13. Estimated timeline and budget for PEN-Plus scaleup

Year	New hospitals starting PEN-Plus	Cumulative number of hospitals	Cumulative number of patients	Annual cost
2021	Salima Karonga	4	3,678	$1,034,688
2022	5 new	9	4,984	$1,369,724
2023	9 new	18	6,705	$2,373,201
2024	12 new	30	9,462	$2,749,260
2025	15 new	45	13,422	$3,888,392
2026	11 new	56	17,988	$5,217,214
			TOTAL:	**$16,632,679**

Table 144. Estimated budget by components for PEN-Plus scaleup

Cost component	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Patient-level costs Outpatient medical service (overhead, support staff, food, capital), point of care lab tests, drugs & medications, consumables, local personnel (1 physician, 2 nurses and data officer)	547,122	810,564	1,259,136	1,929,439	2,855,523	3,790,490
Facility-level costs *(initial one-off investment)* Construction of clinic space, supplies and equipment, training facility construction, baseline training course, roll-out meeting costs	242,840	309,162	567,621	771,965	984,256	736,223
Central resources Central personnel (program manager, coordinator), mentorship visits (sub-specialist support, e.g., cardiology and endocrinology), cardiac surgery	245,096	249,998	254,998	47,856	48,813	49,790
Health system upgrades			291,446			640,710
Total	1,034,688	1,369,724	2,373,201	2,749,260	3,888,592	5,217,214

As part of the national operational plan, the MOHP will lead efforts to further adapt these estimates to the Malawi context. As estimates become more accurate, they will better serve as key benchmarks in financing.

Phase III: Maintenance and evaluation

Upon completion of national scale-up of PEN-Plus to all first-level hospitals, the PEN-Plus national program will focus on the maintenance and evaluation of the services. Specifically, the workforce will require routine refresher trainings and mentorship. Initially, mentorship may rely on local internists, pediatricians, and advanced general practitioners. As the volume of sub-specialists in the country increases, the mentorship program will strengthen. In addition, the Ministry of Health will focus on sustaining and upgrading the supply chain surrounding essential medicines and equipment. As standards in pharmaceuticals and diagnostic equipment advances, the list of priority items for procurement will grow as well. Lastly, strengthening the monitoring and evaluation frameworks around implementation, clinical, and operational outcomes will allow for effective quality improvement projects.

As with Phase II, this next phase will require a committed collection of strategic partners to ensure maintenance of quality PEN-Plus services. As the Ministry of Health and Population continues to grow, the proportion of resources coming from external partners will gradually reduce as to move towards greater self-sufficiency.

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Appendices

Appendix 1. Conditions and Interventions Prioritized by the Malawi NCDI Poverty Commission

Condition(s)	Intervention	Health System Level
Asthma	Management of acute exacerbations of asthma and COPD using systemic steroids, inhaled beta-agonists, and, if indicated, oral antibiotics and oxygen therapy	Health Center
Asthma	Low-dose inhaled corticosteroids and bronchodilators for asthma and for selected patients with COPD	Health Center
Asthma	Management of acute ventilatory failure secondary to acute exacerbations of asthma and COPD; in COPD use of bilevel positive airway pressure preferred	District Hospital
Bipolar disorder	Management of bipolar disorder using generic mood-stabilizing medications and psychosocial treatment	Health Center
Breast cancer	Treat early-stage breast cancer with appropriate multimodal approaches, including generic chemotherapy, with curative intent, for cases that are referred from health centers and first-level hospitals following detection using clinical examination	Central Hospital
Cancers	Palliative care and pain control services*	Community
Cervical cancer	Opportunistic screening for cervical cancer using visual inspection or HPV DNA testing and treatment of precancerous lesions with cryotherapy	Health Center
Cervical cancer	Treatment of early-stage cervical cancer	District Hospital
Chronic kidney disease	Treatment of hypertension in kidney disease, with use of ACEi or ARBs in albuminuric kidney disease	Health Center
Cirrhosis and other chronic liver diseases due to other causes	Hepatitis B and C testing of individuals identified in the national testing policy (i.e., based on endemicity and risk level), with appropriate referral of positive individuals to trained providers	District Hospital
Diabetes mellitus	Screening for diabetes in all high-risk adults	Health Center
Diabetes mellitus	Prevention of long-term complications of diabetes through blood pressure, lipid, and glucose management as well as consistent foot care	Community
Diabetes mellitus	Diabetic retinopathy screening via telemedicine, followed by treatment using laser photocoagulation	District Hospital
Diabetes mellitus	Screening and management of albuminuric kidney disease with ACEi or ARBs, including targeted screening among people with diabetes	Health Center
Diabetes mellitus	Screening for diabetes in all pregnant women	Health Center
Diabetes mellitus	Diabetes self-management education	Health Center
Epilepsy	Management of epilepsy using generic anti-epileptics	Health Center
Ischemic heart disease, Hypertensive heart disease, haemorrhagic stroke, ischemic stroke	**Medical management of acute heart failure**	**District Hospital**
	Medical management of chronic heart failure with diuretics, beta-blockers, ace-inhibitors, and mineralocorticoid antagonists	Health Center
	Use of aspirin in case of suspected myocardial infarction	Community
	Use of percutaneous coronary intervention for acute myocardial infarction where resources permit	Central Hospital
	Use of unfractionated heparin, aspirin, and generic thrombolytics in acute coronary events	Central Hospital
	Combination therapy for persons with multiple risk factors to prevent CVD (primary prevention)	Health Center
	Long term management of IHD, stroke, and PVD with aspirin, beta blockers, ACEi, and statins (as indicated), for secondary prevention	Health Center
	Screening and management of hypertensive disorders in pregnancy	Health Center

Condition(s)	Intervention	Health System Level
	Opportunistic screening for hypertension for all adults, with treatment decisions guided by absolute CVD risk	Health Center
Leukaemia	Treat selected early-stage childhood cancers with curative intent in paediatric cancer units/hospitals	Central Hospital
Liver cancer due to hepatitis B	For individuals testing positive for hepatitis B and C, assessment of treatment eligibility by trained providers followed by initiation and monitoring of antiviral treatment when indicated	District Hospital
Major depressive disorder; Anxiety disorders	Management of depression and anxiety disorders with psychological and generic antidepressant therapy	Health Center
Neural tube defects; Congenital heart anomalies	Provide iron and folic acid supplementation to pregnant women, as well as food/caloric supplementation to pregnant women in food insecure households	Health Center
Paralytic ileus and intestinal obstruction; Appendicitis	Basic first-level hospital surgical services*	District Hospital
Psychotic disorders	Management of schizophrenia using generic anti-psychotic medications and psychosocial treatment	Health Center
Rheumatic heart disease	Treatment of acute pharyngitis in children to prevent rheumatic fever	Health Center
Rheumatic heart disease	Secondary prophylaxis with penicillin for rheumatic fever or established RHD	Health Center
Sickle cell disorders	In settings where sickle cell disease is a public health concern, universal newborn screening followed by standard prophylaxis against bacterial infections and malaria*	Health Center
* Cross-cutting services		

Appendix 2. Stakeholder Consultation Group

Specialties & Institutions Represented in the Stakeholder Consultation Group	
Specialties	**Organizations**
• Cardiology • Chronic kidney disease • Chronic respiratory disease • Diabetes • Diabetes (ophthalmology) • Emergency medicine • Endocrinology (pediatric) • Epidemiology • Epilepsy • Family medicine • Health economics • Internal medicine • Labs & supplies • Medications • Nursing • Sickle cell disease	• Baylor University • Cancer Survivors Quest • Central Medical Stores Trust • Diabetes Association of Malawi • Kamuzu Central Hospital • Lighthouse • Malawi College of Health Sciences • Malawi College of Medicine • Malawi Epidemiology & Intervention Research Unit (MEIRU) • Malawi Health • Malawi Health Equity Network (MHEN) • Malawi-Liverpool-Wellcome Trust Clinical Research Programme (MLW) • Medical Council of Malawi • MOH Department of Policy and Planning • MOH Diagnostics • MOH Health Technical Support Services – pharmaceuticals • MOH Human Resources • MOH NCD Unit • MOH Nursing Services • MOH Quality Management Directorate • MOH Research • MOH – community and district hospital staff • Mzuzu Central Hospital • National Organization of Nurses & Midwives of Malawi • Partners In Health • Partners in Hope • Queen Elizabeth Central Hospital • University of North Carolina • WHO

Appendix 3. Services Prioritized by Stakeholder Consultation Group for District Hospital (PEN-Plus) Clinic

Family	Condition	Diagnostic Services	Treatment Services
Endocrine	Diabetes	Glucose and A1C measurement; Chemistries for DKA diagnosis (blood gas analysis, pH,bicarbonate); serum ketones (beta hydroxybutyric acid etc.)	Initiate and titrate insulin; Recognize and treat management of complications, including DKA; Counseling and education on home glucometer use and care; Diabetic foot care; Retinopathy screening
	Thyroid Disorders	Thyroid Function Tests (TSH,T3, free T4)	Levothyroxine
	Congenital Adrenal Hyperplasia	Thorough history and physical examination; examine genitalia; Abdominal USS; Fingerstick glucose	Correct hypoglycemia
Cardiac		Echocardiography; ECG; X-ray; BP (adult & peds)	Medication management (anti-hypertensives, diuretics, sildenafil); HR control; medical management of ischemic heart disease (nitrates, ASA); Referrals for surgical evaluation; Arrhythmia management; Anticoagulation
Hematology		Diagnosis of sickle cell; diagnosis of other heme conditions (interpretation of peripheral blood smears, coagulation and clotting tests, and factor assays); Bone marrow biopsy; Xray and ultrasound; Ophthalmology services	Sickle Cell: Initial stabilization of pain crisis; manage liver and other end organ complications, severe anemia; Management to avoid acute complications; Hemophilia: manage hemarthrosis or other bleeding; treatment of complications (ophthalmology, physiotherapy, orthopedics)
GI		Abdominal ultrasound; Diagnostic paracentesis; electrolytes and renal function tests; Hepatitis B antigen; Hepatitis B VL (Xpert); TB (Xpert); urine schistosomiasis	Management of chronic liver disease; therapeutic paracentesis; treatment of Hepatitis B
Neurologic		Work up of common causes including HIV, syphilis, chemistries, LFTs, FBC, clotting, coagulation, lipid testing, kidney function tests, glucose testing, CSF analysis	Initial stabilization of status epilepticus, acute stroke, delirium; Ongoing management: identification of risk factors and history, treating underlying conditions with anti-epileptics; Counseling and training for guardians on feeding, transfers, mobilization, ongoing care, seizure safety; Management of complications
Pulmonary		TB diagnosis; Chest X-ray	Manage acute asthma / COPD exacerbations and initiate long term management; patient education and counseling
Renal		Kidney ultrasound, serum creatinine and electrolytes, urine dipstick, urine microscopy, evaluation of CKD risk factors	Optimization of medication for volume and electrolyte management; management of underlying conditions and comorbidities; referral to central hospital for RRT consideration

Proposed PEN-Plus Training Lectures and Schedule

Time	Day 1	Day 2	Day 3	Day 4
8:00 AM	Introduction and Pre-Test	CV: Epi and Pathology	Pulmonary: Epi and Pathology	GI: Liver Disease
9:00 AM	DM: Epi and Pathology	CV: HTN and Preeclampsia	P: Asthma	GI: Ascites, Cirrhosis
10:00 AM	DM: Diagnosis			Hematology: Sickle Cell Disease
11:00 AM	DM: Medications	CV: DVT, PE and anticoagulation	P: COPD, Bronchiectasis, Cough	*Neurology: Epilepsy*
12:00 PM	**Lunch**	**Lunch**	**Lunch**	**Lunch**
1:00 PM	DM: Insulin	CV: CHF and RHD	Renal: Epi and Pathology	*Case Reviews*
2:00 PM	DM: Complications		R: CKD	
3:00 PM	*DM: Foot care, diet, lifestyle*	*CV: Counseling in CV Disease*	*R: Electrolytes*	*Post Test*

Proposed PEN-Plus Training Lecture Topics

- Diabetes Mellitus: Epidemiology and Pathology
- Diabetes Mellitus: Diagnosis
- Diabetes Mellitus: Medications
- Diabetes Mellitus: Insulin
- Diabetes Mellitus: Complications
- Diabetes Mellitus: Foot care, diet and lifestyle
- Cardiovascular: Epidemiology and Pathology
- Cardiovascular: Hypertension and Preeclampsia
- Cardiovascular: Chronic Heart Failure and Rheumatic Heart Disease
- Cardiovascular: Deep Venous Thrombosis, Pulmonary Embolism and Anticoagulation
- Cardiovascular: Counseling in Cardiovascular Disease
- Pulmonary: Epidemiology and Pathology
- Pulmonary: Asthma
- Pulmonary: COPD, Bronchiectasis, Cough
- Renal: Epidemiology and Pathology
- Renal: Chronic Kidney Disease
- Renal: Electrolytes
- Gastroenterology: Liver Disease
- Gastroenterology: Ascites and Cirrhosis
- Hematology: Sickle Cell Disease
- Neurology: Epilepsy

Appendix 5. Indicators Included in NCD Program's Indicator Handbook

HYPERTENSION	DIABETES TYPE1	DIABETES TYPE2	ASTHMA	COPD	EPILEPSY	MENTAL HEALTH
Number of total patients with hypertension enrolled in care (health-facility based)	Proportion of diabetes patients with cardiovascular disease complication (health-facility based)	Number of total patients with Type 2 Diabetes enrolled in care (health-facility based)	Number of total patients with Asthma enrolled in care (health-facility based)	Number of COPD patients newly registered in the reporting period (health-facility based)	Number of total patients with epilepsy enrolled in care (health-facility based)	Number of total patients with mental illness enrolled in care
Number of hypertension patients newly registered (health-facility based)	Number of total patients with Type 1 Diabetes enrolled in care (health-facility based)	Number of Type 2 Diabetes patients newly registered (health-facility based)	Number of Asthma patients newly registered (health-facility based)	Number of COPD patients that have defaulted (health-facility based)	Number of patients with epilepsy newly registered (health-facility based)	Number of mental health patients newly registered (health-facility based)
Number of hypertension patients defaulted (health-facility based)	Number of Type 1 Diabetes patients newly registered (health-facility based)	Number of Type 2 Diabetes patients defaulted (health-facility based)	Number of Asthma patients that defaulted (health-facility based)	Proportion of COPD patients enrolled in care with a visit in the last 3 months (health-facility based)	Number of patients with epilepsy that have defaulted (health-facility based)	Number of mental health patients that have defaulted (health-facility based)
Proportion of hypertension patients currently enrolled and with a visit in the last 3 months (health-facility based)	Number of Type 1 Diabetes patients defaulted (health-facility based)	Proportion of Type 2 Diabetes patients currently enrolled and with a visit in the last 3 months (health-facility based)	Proportion of Asthma patients enrolled in care with a visit in the last 3 months (health-facility based)		Proportion of epilepsy patients enrolled in care with a visit in the last 3 months (health-facility based)	Proportion of mental health patients seen in the last 3m
Proportion of hypertension patients with cardiovascular disease complication (health-facility based)	Proportion of Type 1 Diabetes patients currently enrolled and with a visit in the last 3 months (health-facility based)	Proportion of diabetes Type 2 patients with Blood sugar controlled (FBS <=7mmol/l or <=126 mg/dL) (health-facility based) at last visit	Proportion patients with asthma diagnosis with disease severity recorded at most recent visit (health-facility based)		Proportion of epilepsy patients with no seizures since last visit (health-facility based)	Proportion of mental health patients who reported a hospitalization due to mental health at their last visit
Proportion of hypertension patients with CV risk % assessed during visit in last 3 months (health-facility based)	Proportion of diabetes Type 1 patients with Blood sugar controlled (FBS <=7mmol/l or <=126 mg/dL) (health-facility based) at last visit	Proportion of diabetes Type 2 patients on Insulin at last visit (health-facility based)	Proportion of asthma patients with disease controlled (severity at "intermittent" or "mild persistent" at last visit) (health-facility based)		Proportion of epilepsy patients hospitalized for the condition since last visit (health-facility based)	Proportion of mental health patients on medication who reported side effects

HYPERTENSION	DIABETES TYPE1	DIABETES TYPE2	ASTHMA	COPD	EPILEPSY	MENTAL HEALTH
Proportion of hypertension patients currently enrolled with Blood pressure controlled (BP ≤ 140/90) at last visit (health-facility based)			Proportion of asthma patients hospitalized for the condition since last visit (health-facility based)			Proportion of mental health patients who were stable at the last visit
Proportion of hypertension patients hospitalized for the condition since last visit (health-facility based)			Number of total patients with COPD enrolled in care (health-facility based)			

Appendix 6. NCD Master Cards

NCD Patient Card	*NCD OTHER*	*Version 1*	Transfer-In Date		**NCD Reg no**		**Year**	

Patient / Guardian Details				**Patient Overview**				
Patient Name				**Diagnoses**	☐ Rheumatoid arthritis ☐ Cirrhosis ☐ DVT/PE ☐ Sickle Cell Disease	Date:		**Comorbidities**: ☐ Hypertension ☐ Diabetes ☐ CKD ☐ Other:________
Sex,DOB	M	F	DOB/Age:		☐ Other ______________ ☐ Other ______________	Date:		
Physical address								
Patient phone				**Patient History**	HIV: ☐ R ☐ NR	ART Start Date:	TB: ☐ smear pos ☐ smear neg ☐ EPTB ☐ never had TB	Year:
Guardian Name								
Guardian phone			relation to patient		Date test:			
Agrees to FUP	N	Y	CHW Name:	**Outcome**: Discharge / Default / Stop Tx / Transfer Out / Death	**Date**:			

Imaging Results	**Screening (Frequency per protocol)**								**History of Hospitalizations**				
ECHO ☐ | Date: Results:	Date	Proteinuria	Cr	K+	RBS	Lipid profile	Date	HIV	Date of Discharge	Length of Stay	Reason for Admission	Discharge Diagnosis	Discharge Medications
		☐ None ☐ Trace ☐ 1+ ☐ 2+ ☐ 3+ ☐ 4+				☐ Normal ☐ High lipids ☐ High TGs							
		☐ None ☐ Trace ☐ 1+ ☐ 2+ ☐ 3+ ☐ 4+				☐ Normal ☐ High lipids ☐ High TGs							
ECG ☐ | Date: Results:		☐ None ☐ Trace ☐ 1+ ☐ 2+ ☐ 3+ ☐ 4+				☐ Normal ☐ High lipids ☐ High TGs							
		☐ None ☐ Trace ☐ 1+ ☐ 2+ ☐ 3+ ☐ 4+				☐ Normal ☐ High lipids ☐ High TGs							

Ht (cm) ____ Visit Date	Vitals: Wt (kg) /Ht (cm)	Wt change	BP (mmHg)	HR (reg/irreg)	% SPO2	Risk Assessment: Tobacco	Alcohol	# of F/V portions	Days/ wk of 30 min exercise	Hospitalized since last visit for NCD?	Diagnosis	Medications	Medications changed?	Comments	Next Appt. Date	Next Appt location
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3

NCD Patient Card	*NCD OTHER*	*Version 1*	Transfer-In Date		**NCD Reg no**		**Year**	

Ht (cm) ____ Visit Date	Vitals: Wt (kg) /Ht (cm)	Wt change	BP (mmHg)	HR (reg/irreg)	% SPO2	Risk Assessment: Tobacco	Alcohol	# of F/V portions	Days/ wk of 30 min exercise	Hospitalized since last visit for NCD?	Diagnosis	Medications	Medications changed?	Comments	Next Appt. Date	Next Appt location
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3
☐ Missed						[] Current [] Never [] Stopped	[] Current [] Never [] Stopped			☐ No ☐ Yes			[ ] N [ ] Y			[] ADV [] IC3

Notes

NCD Patient Card ***Chronic Lung Disease*** *Version 1* Transfer In Date ☐ NCD Reg No ☐ Year

Patient / Guardian Details		
Patient Name		
Sex, DOB	**M** **F**	DOB/Age:
Physical Address		
	Near:	
Patient Phone		
Guardian Name		
Guardian Phone		Relation to patient
Agrees to FUP	**N** **Y**	CHW Name:

Patient Overview				
Diagnoses	Asthma ☐	Date:	Family History	Asthma Y N UNK
	COPD ☐	Date:		COPD Y N UNK
Patient History & Exposures	HIV: R NR Date Test:	ART Start Date:	TB ☐ smear pos ☐ smear neg ☐ EPTB Year:____ ☐ never had TB	
	☐ Chronic dry cough	Duration: Age at onset:	☐TB contact	Date:
	Cooking	☐Indoor ☐Outdoor	☐Smoking	Date:
	Occupation:		☐Second hand smoking	Date:
	Occupational Exposure ☐	Date:		

Visit Date	Planned Visit?	Ht	Wt	Day sx	Night sx	Beta-agonist inhaler use: frequency				Steroid inhaler daily?	Smoking	Passive smoking	Indoor cooking	Exacerbation on today?	Asthma severity					COPD	Other Diagnosis:	Treatment				Comments	Next Appt Date
	Y/N	cm	kg	#/week	#/week	#/day	#/wk	#/mo	#/yr	Y/N	# cig/day	Y/N	Y/N	Y/N	Intermittent	Mild persistent	Mod persistent	Severe persistent	Uncontrolled			Inhaled B-agonist	Inhaled steroid	Oral steroid	Other		
	Y N									Y N		Y N	Y N	Y N	☐	☐	☐	☐	☐	☐							
	Y N									Y N		Y N	Y N	Y N	☐	☐	☐	☐	☐	☐							
	Y N									Y N		Y N	Y N	Y N	☐	☐	☐	☐	☐	☐							
	Y N									Y N		Y N	Y N	Y N	☐	☐	☐	☐	☐	☐							

NCD Patient Card ***Chronic Lung Disease*** *Version 1* Transfer In Date ☐ NCD Reg No ☐ Year

Visit Date	Planned Visit?	Ht	Wt	Day sx	Night sx	Beta-agonist inhaler use: frequency				Steroid inhaler daily?	Smoking	Passive smoking	Indoor cooking	Exacerbation on today?	Asthma severity					COPD	Other Diagnosis:	Treatment				Comments	Next Appt Date
	Y/N	cm	kg	#/week	#/week	#/day	#/wk	#/mo	#/yr	Y/N	# cig/day	Y/N	Y/N	Y/N	Intermittent	Mild persistent	Mod persistent	Severe persistent	Uncontrolled			Inhaled B-agonist	Inhaled steroid	Oral steroid	Other		
	Y N									Y N		Y N	Y N	Y N	☐	☐	☐	☐	☐	☐							
	Y N									Y N		Y N	Y N	Y N	☐	☐	☐	☐	☐	☐							
	Y N									Y N		Y N	Y N	Y N	☐	☐	☐	☐	☐	☐							
	Y N									Y N		Y N	Y N	Y N	☐	☐	☐	☐	☐	☐							
	Y N									Y N		Y N	Y N	Y N	☐	☐	☐	☐	☐	☐							
	Y N									Y N		Y N	Y N	Y N	☐	☐	☐	☐	☐	☐							
	Y N									Y N		Y N	Y N	Y N	☐	☐	☐	☐	☐	☐							

Outcome: Discharge / Default / Stop Tx / Transfer Out / Death **Date**:

Notes

Peak Flow / Spirometry		
	Date	Results
Initial		
Follow ups (see criteria)		

Hospitalization History for Lung Disease				
Date	Length of Stay (days)	Reason for Admission	Discharge Diagnosis	Discharge Medications

NCD Patient Card ***Chronic Heart Disease*** **Enrollment Date** ______ **NCD Reg no** ______

Patient / Guardian Details				Patient Overview							
Patient Name				**Diagnoses**	**CCF:** ☐ Dilated ☐ Restrictive ☐ Valvular ☐ Unknown	Date:	☐ CAD	Date:	☐ PE	Date:	
Sex,DOB	M	F	DOB/Age:				☐ Stroke	Date:	☐ DVT	Date:	
Physical address					☐ Rheumatic ☐ Congenital	Date:	☐ Afib	Date:	☐ Other:________	Date:	
Patient phone				**Patient History**	HIV: ☐ R ☐ NR Date test:	ART Start Date:	TB: ☐ smear pos ☐ smear neg ☐ EPTB ☐ never had TB Year: ____________________		**Comorbidities**: ☐ Hypertension ☐ Diabetes ☐ CKD ☐ Other:__________		
Guardian Name											
Guardian phone		relation to patient									
Agrees to FUP	N	Y	CHW Name:	**Outcome**: Discharge / Default / Stop Tx / Transfer Out / Death	**Date**:						

Imaging Results	Screening (Frequency per protocol)							History of Hospitalizations				
	Date	Proteinuria	Cr	K+	RBS	Lipid profile	HIV	Date of Discharge	Length of Stay	Reason for Admission	Discharge Diagnosis	Discharge Medications
ECHO ☐ | Date: Results:		☐ None ☐ Trace ☐ 1+ ☐ 2+ ☐ 3+ ☐ 4+				☐ Normal ☐ High lipids ☐ High TGs						
		☐ None ☐ Trace ☐ 1+ ☐ 2+ ☐ 3+ ☐ 4+				☐ Normal ☐ High lipids ☐ High TGs						
ECG ☐ | Date: Results:		☐ None ☐ Trace ☐ 1+ ☐ 2+ ☐ 3+ ☐ 4+				☐ Normal ☐ High lipids ☐ High TGs						
		☐ None ☐ Trace ☐ 1+ ☐ 2+ ☐ 3+ ☐ 4+				☐ Normal ☐ High lipids ☐ High TGs						

Ht (cm) ____	Vitals					Signs and Symptoms since last visit					Exam				Risk Assessment					Medications (Use abbreviations on reverse side)										Pt Ed, Referral and Homecare					
Visit Date	Wt (kg)	Wt change	BP (mmHg)	HR (reg/irreg)	% SPO2	Orthopnea	Dyspnea on exertion	Dry cough	Fatigue	Hospitalized since last visit for NCD?	Oedema	Bibasilar Crackles	JVP Elevated	Volume Status	NYHA Stage	Alcohol	Tobacco	Salt or Fluid Restricted	Concern for Depression or Anxiety	**Medications**	ASA	Diuretic	ACE-I	BB	CCB	Spironolactone	Benzathine PCN	Statin	Other	Took medications today **If no, why not?**	Diet- ➔Salt or Fluid	Mental Health Referral	Palliative Referral	Request CHW F/U	Next Visit Date / Clinician Sig
☐ Missed						☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ Yes ☐ No	☐ No ☐ Trace ☐ + ☐ 2+ ☐ 3+	☐ Yes ☐ No	☐ Yes ☐ No	☐ Hypo ☐ Euvol ☐ Hyper	I II IIII V	☐ Current ☐ Never ☐ Stopped	☐ Current ☐ Never ☐ Stopped	☐ Yes ☐ No	☐ Yes ☐ No	Name Dose Freq	☐					☐	☐			☐ Y ☐ N→	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	

Clinical assessment and plan: ____

____

NCD Patient Card ***Chronic Heart Disease*** **Enrollment Date** ______ **NCD Reg no** ______

Ht (cm) ____	Vitals					Signs and Symptoms since last visit					Exam				Risk Assessment					CHF Medications (Use abbreviations on reverse side)									Pt Ed, Referral and Homecare				
Visit Date	Wt (kg) /Ht (cm)	Wt Δ	BP (mmHg)	HR	% SPO2	PND	DOE	Orthopnea	Dry Cough	Fatigue	Edema	Bibasilar Crackles	JVD Elevated	Volume Status	NYHA Stage	Alcohol	Tobacco	Salt or Fluid Restricted	Concern for Depression or Anxiety	**Medications**	ASA	Diuretic	ACE-I	BB	CCB	Spironolactone	Benzathine PCN	Other	Took medications today **If no, why not?**	Diet- ➔Salt or Fluid	Mental Health Referral	Request CHW F/U	Next Visit Date / Clinician Sig
☐ Missed						☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ No ☐ Trace ☐ + ☐ 2+ ☐ 3+	☐ Yes ☐ No	☐ Yes ☐ No	☐ Hypo ☐ Euvol ☐ Hyper	I II IIII V	☐ Yes ☐ Never ☐ Quit	☐ Yes ☐ Never ☐ Quit	☐ Yes ☐ No	☐ Yes ☐ No	Name Freq	☐					☐	☐		☐ Y ☐ N→	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
☐ Missed						☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ No ☐ Trace ☐ + ☐ 2+ ☐ 3+	☐ Yes ☐ No	☐ Yes ☐ No	☐ Hypo ☐ Euvol ☐ Hyper	I II IIII V	☐ Yes ☐ Never ☐ Quit	☐ Yes ☐ Never ☐ Quit	☐ Yes ☐ No	☐ Yes ☐ No	Name Dose Freq	☐					☐	☐		☐ Y ☐ N→	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
☐ Missed						☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ No ☐ Trace ☐ + ☐ 2+ ☐ 3+	☐ Yes ☐ No	☐ Yes ☐ No	☐ Hypo ☐ Euvol ☐ Hyper	I II IIII V	☐ Yes ☐ Never ☐ Quit	☐ Yes ☐ Never ☐ Quit	☐ Yes ☐ No	☐ Yes ☐ No	Name Dose Freq	☐					☐	☐		☐ Y ☐ N→	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
☐ Missed						☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ No ☐ Trace ☐ + ☐ 2+ ☐ 3+	☐ Yes ☐ No	☐ Yes ☐ No	☐ Hypo ☐ Euvol ☐ Hyper	I II IIII V	☐ Yes ☐ Never ☐ Quit	☐ Yes ☐ Never ☐ Quit	☐ Yes ☐ No	☐ Yes ☐ No	Name Dose Freq	☐					☐	☐		☐ Y ☐ N→	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
☐ Missed						☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ No ☐ Trace ☐ + ☐ 2+ ☐ 3+	☐ Yes ☐ No	☐ Yes ☐ No	☐ Hypo ☐ Euvol ☐ Hyper	I II IIII V	☐ Yes ☐ Never ☐ Quit	☐ Yes ☐ Never ☐ Quit	☐ Yes ☐ No	☐ Yes ☐ No	Name Dose Freq	☐					☐	☐		☐ Y ☐ N→	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
☐ Missed						☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ No ☐ Trace ☐ + ☐ 2+ ☐ 3+	☐ Yes ☐ No	☐ Yes ☐ No	☐ Hypo ☐ Euvol ☐ Hyper	I II IIII V	☐ Yes ☐ Never ☐ Quit	☐ Yes ☐ Never ☐ Quit	☐ Yes ☐ No	☐ Yes ☐ No	Name Dose Freq	☐					☐	☐		☐ Y ☐ N→	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
☐ Missed						☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ ↑ ☐ ↓ ☐ Same ☐ None	☐ No ☐ Trace ☐ + ☐ 2+ ☐ 3+	☐ Yes ☐ No	☐ Yes ☐ No	☐ Hypo ☐ Euvol ☐ Hyper	I II IIII V	☐ Yes ☐ Never ☐ Quit	☐ Yes ☐ Never ☐ Quit	☐ Yes ☐ No	☐ Yes ☐ No	Name Dose Freq	☐					☐	☐		☐ Y ☐ N→	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	

DIURETIC	CCB - Calcium Channel Blocker	ACE-I - Angiotensin Converting Enzyme Inhibitor	BB - Beta blocker	Statin	Other *Hypertension or Diabetes meds only!*
Hydrochlorothiazide – **HCTZ**	Amlodipine – **AML**	Enalapril – **ENAL**	Atenolol – **ATEN**	Simvastatin – **SIMVA**	Hydralazine – **HYD**
Furosemide – **FURO**	Nifedipine Modified Release – **NIF**	Captopril – **CAPT**	Bisoprolol – **BIS**	Pravastatin – **PRAVA**	Isosorbide Mononitrate – **ISSMN**
Spironolactone –**SPIRO**		Lisinopril – **LISIN**	Propranolol – **PROP**	Atorvastatin – **ATORVA**	

NCD Patient Card ***Chronic Kidney Disease*** **Enrollment Date** ☐ **NCD Reg no** ☐

Patient / Guardian Details				**Patient Overview**				
Patient Name				**Presumed etiology**	**CKD:** ☐Hypertension ☐Diabetes ☐HIV ☐Nephrotic	☐Drugs ☐Others ☐Unknown	Date:	☐ CHF	Date:
SEX,DOB	M	F	DOB/Age:					☐ Hypertension	Date:
Physical address								☐ Diabetes	Date:
Patient phone					Drug (specify)____________		Others(specify)___________	☐ Other (stroke, COPD, CKD)	Date:
Guardian Name				**Patient History**	HIV: ☐R ☐NR		ART Start Date:	History of Dialysis	Date :
Guardian phone		relation to patient			Date test:			TB: ☐ smear pos ☐smear neg ☐ EPTB ☐ never had	Date:
Agrees to FUP	N	Y	CHW Name:	**Outcome**: Discharge / Default / Stop Tx / Transfer Out / Death **Date**:					

Every 3 months			**Screening Every 12 months**		**Imaging(USS) results**		**History of Hospitalizations**				
Date	HIV	HB	RBS	Lipid profile	Date		Date of Discharge	Length of Stay	Reason for Admission	Discharge Diagnosis	Discharge Medications
	☐R ☐NR			☐Normal ☐High lipids ☐High TGs							
	☐R ☐NR			☐Normal ☐High lipids ☐High TGs	Date						
	☐R ☐NR			☐Normal ☐High lipids ☐High TGs							
	☐R ☐NR			☐Normal ☐High lipids ☐High TGs							

	Vital Signs and Labs								**Signs and Symptoms**									**Risk Assessment**				**Medications** (Use abbreviations on reverse side)						**Pt Ed, Referral and Homecare**		Next Visit Date
Visit Date	Height	Wt(kg)	Wt Δ (kg)	BP (mmHg)	GFR	HR	Creat mg/dl)	Urine protein	Confusion	Fatigue	Nausea	Anorexia	Pruritus	Conjunctiva	Ascites	Edema	Other	CKD Stage	NSAID use	Tobacco Use	**Alcohol use**	**Medications**	Diuretic	ACE-I	CCB	BB	Other	Took medications today? If no, why not?	Diet Recommendations	
								☐No ☐trace ☐+☐++☐+++	☐Y ☐N	☐Y ☐N	☐Y ☐N	☐Y ☐N	☐Y ☐N	☐pink ☐pale	☐Y ☐N	☐No ☐trace ☐+☐++☐+++		1-2 3 4-5	☐Y ☐N	☐Yes ☐Never ☐Quit	☐Yes ☐Never ☐Quit	Name Dose Freq						☐Y ☐N→	☐↓Na☐↓K+ ☐↓PRO ☐↑Kcal	

NCD Patient Card ***Chronic Kidney Disease*** **Enrollment Date** ☐ **NCD Reg no** ☐

	Vital Signs and Labs								**Signs and Symptoms**									**Risk Assessment**				**Medications** (Use abbreviations on reverse side)						**Pt Ed, Referral and Homecare**		Next Visit Date
Visit Date	Height	Wt(kg)	Wt Δ (kg)	BP (mmHg)	GFR	HR	Creat mg/dl)	Urine protein	Confusion	Fatigue	Nausea	Anorexia	Pruritus	Conjunctiva	Ascites	Edema	Other	CKD Stage	NSAID use	Tobacco Use	**Alcohol use**	**Medications**	Diuretic	ACE-I	CCB	BB	Other	Took medications today? If no, why not?	Diet Recommendations	
								☐No ☐trace ☐+☐++☐+++	☐Y ☐N	☐Y ☐N	☐Y ☐N	☐Y ☐N	☐Y ☐N	☐pink ☐pale	☐Y ☐N	☐No ☐trace ☐+☐++☐+++		1-2 3 4-5	☐Y ☐N	☐Yes ☐Never ☐Quit	☐Yes ☐Never ☐Quit	Name Dose Freq						☐Y ☐N→	☐↓Na☐↓K+ ☐↓PRO ☐↑Kcal	
								☐No ☐trace ☐+☐++☐+++	☐Y ☐N	☐Y ☐N	☐Y ☐N	☐Y ☐N	☐Y ☐N	☐pink ☐pale	☐Y ☐N	☐No ☐trace ☐+☐++☐+++		1-2 3 4-5	☐Y ☐N	☐Yes ☐Never ☐Quit	☐Yes ☐Never ☐Quit	Name Dose Freq						☐Y ☐N→	☐↓Na☐↓K+ ☐↓PRO ☐↑Kcal	
								☐No ☐trace ☐+☐++☐+++	☐Y ☐N	☐Y ☐N	☐Y ☐N	☐Y ☐N	☐Y ☐N	☐pink ☐pale	☐Y ☐N	☐No ☐trace ☐+☐++☐+++		1-2 3 4-5	☐Y ☐N	☐Yes ☐Never ☐Quit	☐Yes ☐Never ☐Quit	Name Dose Freq						☐Y ☐N→	☐↓Na☐↓K+ ☐↓PRO ☐↑Kcal	
								☐No ☐trace ☐+☐++☐+++	☐Y ☐N	☐Y ☐N	☐Y ☐N	☐Y ☐N	☐Y ☐N	☐pink ☐pale	☐Y ☐N	☐No ☐trace ☐+☐++☐+++		1-2 3 4-5	☐Y ☐N	☐Yes ☐Never ☐Quit	☐Yes ☐Never ☐Quit	Name Dose Freq						☐Y ☐N→	☐↓Na☐↓K+ ☐↓PRO ☐↑Kcal	
								☐No ☐trace ☐+☐++☐+++	☐Y ☐N	☐Y ☐N	☐Y ☐N	☐Y ☐N	☐Y ☐N	☐pink ☐pale	☐Y ☐N	☐No ☐trace ☐+☐++☐+++		1-2 3 4-5	☐Y ☐N	☐Yes ☐Never ☐Quit	☐Yes ☐Never ☐Quit	Name Dose Freq						☐Y ☐N→	☐↓Na☐↓K+ ☐↓PRO ☐↑Kcal	

Notes:-
____
____

DIURETIC	**CCB - Calcium Channel Blocker**	**ACE-I - Angiotensin Converting Enzyme Inhibitor**	**BB - Beta blocker**	**Statin**	**Other** *Hypertension or Diabetes meds only!*
Hydrochlorothiazide – **HCTZ**	Amlodipine – **AML**	Enalapril – **ENAL**	Atenolol – **ATEN**	Simvastatin – **SIMVA**	Hydralazine – **HYD**
Furosemide – **FURO**	Nifedipine Modified Release – **NIF**	Captopril – **CAPT**	Bisoprolol – **BIS**	Pravastatin – **PRAVA**	Isosorbide Mononitrate – **ISSMN**
Spironolactone –**SPIRO**		Lisinopril – **LISIN**	Propranolol – **PROP**	Atorvastatin – **ATORVA**	**Ferrous Sulphate: FeSo**

NCD Patient Card **Yellow Card** ***Hypertension & Diabetes*** *Version 1.3*

Transfer-In Date		**NCD Reg no**		**Year**	

Patient / Guardian Details			
Patient Name			
Sex, DOB	M	F	DOB/Age:
Physical Address			
Patient Phone			
Guardian Name			
Guardian Phone		Relation to patient	
Agrees to FUP	N	Y	CHW Name:

Patient Overview					
Diagnoses	☐ Type 1 DM ☐ Type 2 DM	Date:	Family History	Diabetes ☐ Yes ☐ No ☐ Unknown	
	☐ Hypertension	Date:		Hypertension ☐ Yes ☐ No ☐ Unknown	
Patient History & Complications	HIV: ☐ R ☐ NR Date test: ___________	ART Start Date:	TB: ☐ smear pos ☐ smear neg ☐ EPTB ☐ never had TB		Year:
	☐ Cardiovascular Disease *(e.g. heart attack, ischemic heart disease, CCF)*	Date:	☐ Stroke/TIA		Date:
			☐ PVD *(e.g. ulcers, gangrene)*		Date:
	☐ Retinopathy	Date:	☐ Neuropathy		Date:
	☐ Renal disease *(e.g. elevated creatinine)*	Date:	☐ Sexual dysfunction		Date:

Outcome: Discharge / Default / Stop Tx / Transfer Out / Death **Date**:

Every 3 months			Annual Monitoring				
Date	Proteinuria	HIV test result	**Date**	ECG	Creatinine	Lipid profile	Fundoscopy
	☐ None ☐ 1+ ☐ 2+ ☐ 3+ ☐ 4+	☐ R ☐ NR			mg/dl	☐ Normal ☐ High lipids ☐ High TGs	
	☐ None ☐ 1+ ☐ 2+ ☐ 3+ ☐ 4+	☐ R ☐ NR			mg/dl	☐ Normal ☐ High lipids ☐ High TGs	
	☐ None ☐ 1+ ☐ 2+ ☐ 3+ ☐ 4+	☐ R ☐ NR			mg/dl	☐ Normal ☐ High lipids ☐ High TGs	
	☐ None ☐ 1+ ☐ 2+ ☐ 3+ ☐ 4+	☐ R ☐ NR			mg/dl	☐ Normal ☐ High lipids ☐ High TGs	

Hospitalization History for DM and/or HTN				
Date of Discharge	Length of Stay *days*	Reason for Admission	Discharge Diagnosis	Discharge Medications

Visit Date	Ht *(cm)*	Wt *(kg)*	BMI <19	BMI 19-24.9	BMI 25+	BP	PR	Glucose Monitoring	Risk Assessment: Tobacco	Alcohol	Number of F/V per day	Days per /week of 30m exercise	CV Risk %	Visual Acuity	Foot Check: Neuropathy/PVO	Deformities	Ulcers	Hospitalised since last Visit due to condition?	Medication	Diabetes: Long acting Insulin	Short Acting Insulin	Metformin	Glibenclamide	Anti-hypertensives (Use abbreviations on reverse): Diuretic	CCB	ACE-I	BB	Other (Use abbreviations on reverse): Aspirin	Statin	Other	Next Appt Date
			U	N	O			HbA1C _____% Fingerstick _______mg/dl ☐ Fasting ☐ Random	☐ Current ☐ Never ☐ Stopped	☐ Current ☐ Never ☐ Stopped					☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	Name Dose Freq	☐	☐	☐	☐					☐			
			U	N	O			HbA1C _____% Fingerstick _______mg/dl ☐ Fasting ☐ Random	☐ Current ☐ Never ☐ Stopped	☐ Current ☐ Never ☐ Stopped					☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	Name Dose Freq	☐	☐	☐	☐					☐			

NCD Patient Card **Yellow Card** ***Hypertension & Diabetes*** *Version 1.3*

Transfer-In Date		**NCD Reg no**		**Year**	

Visit Date	Ht *(cm)*	Wt *(kg)*	BMI <19	BMI 19-24.9	BMI 25+	BP	PR	Glucose Monitoring	Risk Assessment: Tobacco	Alcohol	Number of F/V per day	Days per /week of 30m exercise	CV Risk %	Visual Acuity	Foot Check: Neuropathy/PVO	Deformities	Ulcers	Hospitalised since last Visit due to condition?	Medication	Diabetes: Long acting Insulin	Short Acting Insulin	Metformin	Glibenclamide	Anti-hypertensives (Use abbreviations on reverse): Diuretic	CCB	ACE-I	BB	Other (Use abbreviations on reverse): Aspirin	Statin	Other	Next Appt Date
			U	N	O			HbA1C _____% Fingerstick _______mg/dl ☐ Fasting ☐ Random	☐ Current ☐ Never ☐ Stopped	☐ Current ☐ Never ☐ Stopped					☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	Name Dose Freq	☐	☐	☐	☐					☐			
			U	N	O			HbA1C _____% Fingerstick _______mg/dl ☐ Fasting ☐ Random	☐ Current ☐ Never ☐ Stopped	☐ Current ☐ Never ☐ Stopped					☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	Name Dose Freq	☐	☐	☐	☐					☐			
			U	N	O			HbA1C _____% Fingerstick _______mg/dl ☐ Fasting ☐ Random	☐ Current ☐ Never ☐ Stopped	☐ Current ☐ Never ☐ Stopped					☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	Name Dose Freq	☐	☐	☐	☐					☐			
			U	N	O			HbA1C _____% Fingerstick _______mg/dl ☐ Fasting ☐ Random	☐ Current ☐ Never ☐ Stopped	☐ Current ☐ Never ☐ Stopped					☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	Name Dose Freq	☐	☐	☐	☐					☐			
			U	N	O			HbA1C _____% Fingerstick _______mg/dl ☐ Fasting ☐ Random	☐ Current ☐ Never ☐ Stopped	☐ Current ☐ Never ☐ Stopped					☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	Name Dose Freq	☐	☐	☐	☐					☐			
			U	N	O			HbA1C _____% Fingerstick _______mg/dl ☐ Fasting ☐ Random	☐ Current ☐ Never ☐ Stopped	☐ Current ☐ Never ☐ Stopped					☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	Name Dose Freq	☐	☐	☐	☐					☐			
			U	N	O			HbA1C _____% Fingerstick _______mg/dl ☐ Fasting ☐ Random	☐ Current ☐ Never ☐ Stopped	☐ Current ☐ Never ☐ Stopped					☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	Name Dose Freq	☐	☐	☐	☐					☐			

Notes:

Medication Abbreviations

DIURETIC	CCB - Calcium Channel Blocker	ACE-I - Angiotensin Converting Enzyme Inhibitor	BB - Beta blocker	Statin	Other *Hypertension or Diabetes meds only!*
Hydrochlorothiazide – **HCTZ** Furosemide – **FURO** Spironolactone –**SPIRO**	Amlodipine – **AML** Nifedipine Modified Release – **NIF**	Enalapril – **ENAL** Captopril – **CAPT** Lisinopril – **LISIN**	Atenolol – **ATEN** Bisoprolol – **BIS** Propranolol – **PROP**	Simvastatin – **SIMVA** Pravastatin – **PRAVA** Atorvastatin – **ATORVA**	Hydralazine – **HYD** Isosorbide Mononitrate – **ISSMN**

NCD Patient Card ***Epilepsy*** *Version 1* Transfer-In Date: ______ **NCD Reg no** ______ **Year** ______

Green Card

Patient / Guardian Details			
Patient Name			
Sex, DOB	M	F	DOB/Age:
Physical Address			
	Near:		
Patient Phone			
Guardian Name			
Guardn Phone		Relation to patient	
Agrees to FUP	N Y	CHW Name:	

Seizure Type								
Y	N	Tonic Clonic	Y	N	**Clonic**	Y	N	Simple
Y	N	Absence	Y	N	**Tonic**	Y	N	Complex
Y	N	Myoclonic	Y	N	**Atonic**	Y	N	Unclassified

Family History			
Y	N	Unk	Epilepsy
Y	N	Unk	Mental Illness
Y	N	Unk	Behaviour Problems

HIV Status	NR	R	**ART Start Date:**
VDRL	NR	R	U

Patient History at Enrolment	
Date of onset (MM/YYYY):	__ __ / __ __ __ __
Age at onset (in years):	
Marital Status:	
Occupation:	
Education level:	
Medication History: (Including traditional medicine)	

Y	N	Unk	**Pre-ictal Warning**

Post-ictal features							
				Y	N	Unk	Paralysis
Y	N	Unk	Headache	Y	N	Unk	Disorientation
Y	N	Unk	Drowsiness	Y	N	Unk	Nausea
Y	N	Unk	Poor concentration	Y	N	Unk	Memory loss
Y	N	Unk	Poor verbal or cognitive skills	Y	N	Unk	Hyperactivity

Medical & Surgical History			
Y	N	Unk	Head injury/Trauma/Head surgery
Y	N	Unk	History of seizure
Y	N	Unk	Complications at birth
Y	N	Unk	Neonatal infection/Cerebral Malaria/Meningitis
Y	N	Unk	Delayed milestones in early childhood

Triggers							
Y	N	Unk	Alcohol	Y	N	Unk	Fever
Y	N	Unk	Sounds / Light / Touch				
Y	N	Unk	Emotional Stress / Anger/Boredom/				
Y	N	Unk	Sleep deprivation/Overtiredness				
Y	N	Unk	Missed medication				
Y	N	Unk	Menstruation (For women of reproductive age)				

Patient Overview

Exposures		
☐	Smoking	Date:
☐	Alcohol	Date:
☐	Pigs/pork	Date:
☐	Traditional medicine	Date:
☐	Other:	Date:

Complications		
☐	Injuries	Date:
☐	Burns	Date:
☐	Status Epilepticus	Date:
☐	Psychosis	Date:
☐	Drug Related	Date:
☐	Other	Date:

NCD Patient Card ***Epilepsy*** *Version 1* Transfer-In Date: ______ **NCD Reg no** ______ **Year** ______

Green Card

Visit Date	Height (cm)	WT (Kg)	BMI	**Seizure Activity**: Seizure since last visit	Number of Seizures	Any Triggers	**Seizure Trigger**: Alcohol	Sleep deprivation	Missed medication	Sounds/Light/touch	Fever	Stress	Menstruation	**Silent Markers**: Tongue biting	Incontinence	**Hospitalized since last visit**	**Pregnant**	**On family planning**	**Treatment Details (write dose)**: Carbamazepine	Phenobarbitone	Phenytoin	Sodium valproate	Other	Comments	Next Appointment Date
				☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐							
				☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐							
				☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐							
				☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐							
				☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐							
				☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐							
				☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐							
				☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐							
				☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐							
				☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐							
				☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐							
				☐		☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐							

Outcome: Discharge / Default / Stop Tx / Transfer Out / Died Date:

Notes

NCD Patient Card WHITE Card | ***Mental Health*** | *Version 1.3* | Transfer-In Date ☐ | NCD Reg no ☐ | Year ☐

Patient / Guardian Details	
Patient Name	
Sex, DOB	**M** | **F** | DOB/Age:
Physical Address	
	Near:
Phone No.	
Marital Status	☐Single ☐Married ☐Divorced ☐Widowed
Occupation	
Guardian Name	
	Relation to patient:
Guardian Phone No.	
Agrees to FUP	☐Y ☐N
	CHW Name:

Patient Overview

Diagnoses		
	☐Schizophrenia	Date:
	☐Mood (Affective) Disorder	Date:
	☐Mood (Affective) Disorder	Date:
	☐Acute & Transient Psychotic	Date:
	☐Schizoaffective Disorder	Date:
	☐Anxiety Disorder	Date:
	☐Organic Mental Disorder (acute)	Date:
	☐Organic Mental Disorder	Date:
	☐Drug Use Mental Disorder	Date:
	☐Alcohol Use Mental Disorder	Date:
	☐ Other, specify:_____________	Date:

Family History

Epilepsy
☐ Yes ☐ No ☐Unknown
Mental illness
☐Yes ☐No ☐ Unknown
Behavioural problems
☐ Yes ☐ No ☐Unknown

TB: ☐ Smear Pos ☐ Smear Neg ☐ EPTB
Year________ ☐ Never had TB
Alcohol: ☐ Current ☐ Past ☐ Never
years: ________ Date last use: _________
Marijuana: ☐ Current ☐ Past ☐ Never
years: ________ Date last use: ________

Patient History & Exposures

HIV: ☐R ☐NR
Date tested:_______________

ART Start Date:

Presenting Features	
☐ Hallucination	Date:
☐ Delusions	Date:
☐ Disorganised/disruptive behaviour	Date:
☐ Disorganised speech	Date:
☐ Depressive symptoms	Date:
☐ Other, specify:___________________ ________________________	Date:

Other drug:______☐ Current ☐ Past ☐ Never
years: ________ Date last use: _________
Traditional Medicine: ☐ Current ☐ Past ☐ Never
years: ________ Date last use: _________

Hospitalization History				
Date of Discharge	Length of Stay *days*	Reason for Admission	Discharge Diagnosis	Discharge Medications

Outcome: Discharge / Default / Stop Tx / Transfer Out / Death **Date**:

NCD Patient Card WHITE Card | ***Mental Health*** | *Version 1.3* | Transfer-In Date ☐ | NCD Reg no ☐ | Year ☐

Date			History and Mental Status Examination: *Assess for the following symptoms*											Substance Use		Family Planning					Treatment Details: *Write dosage and Frequency*									
	Height (cm)	Weight (kg)	PHQ 9 score	Depressed Mood	Elevated Mood	Disruptive Behaviour	Disorganised Speech	Delusions	Hallucinations	Lack of Insight	Other: *specify in notes section*	Patient Stable?	Able to do activities of daily living?	Marijuana	Alcohol	Pregnant?	On Family Planning?	Suicide risk?	Medication Side effects?	Hospitalised since last Visit due to this condition?	counselling provided	Chlorpromazine (CPZ)	Haloperidol	Fluphenazine	Carbamazepine	Sodium Valproate	Risperidone	Fluoxetine	*Other: specify in notes section*	**Next Appt date**
				Y N	Y N	Y N	Y N	Y N	Y N	Y N	☐	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	
				Y N	Y N	Y N	Y N	Y N	Y N	Y N	☐	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	
				Y N	Y N	Y N	Y N	Y N	Y N	Y N	☐	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	
				Y N	Y N	Y N	Y N	Y N	Y N	Y N	☐	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	
				Y N	Y N	Y N	Y N	Y N	Y N	Y N	☐	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	
				Y N	Y N	Y N	Y N	Y N	Y N	Y N	☐	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	
				Y N	Y N	Y N	Y N	Y N	Y N	Y N	☐	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	
				Y N	Y N	Y N	Y N	Y N	Y N	Y N	☐	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	
				Y N	Y N	Y N	Y N	Y N	Y N	Y N	☐	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	
				Y N	Y N	Y N	Y N	Y N	Y N	Y N	☐	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	
				Y N	Y N	Y N	Y N	Y N	Y N	Y N	☐	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	
				Y N	Y N	Y N	Y N	Y N	Y N	Y N	☐	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	Dose Freq	

Notes:

Appendix 7. NCD DHIS2 Quarterly Reporting Form

NON COMMUNICABLE DISEASES FACILITY QUARTERLY REPORTING FORM
FACILITY_____QUARTER_____YEAR_____

HYPERTENSION	
Patients enrolled and active in care[1]	
Patients newly registered during reporting period	
Patients who have defaulted[2] during the reporting period	
Patients with a visit in last 3 months	
Currently enrolled patients that have ever experienced a complication[3]	
Patients with a visit in last 3 months (*excluding new patients*) that have BP below 140/90	

ASTHMA	
Patients enrolled and active in care[1]	
Patients newly registered during reporting period	
Patients who have defaulted during the reporting period	
Patients with a visit in last 3 months	
Patients with disease severity recorded at most recent visit	
Patients with disease controlled (severity at "intermittent" or "mild persistent" at last visit)	
Patients hospitalized for the condition since last visit	

EPILEPSY	
Patients enrolled and active in care[1]	
Patients newly registered during reporting period	
Patients who have defaulted[2] during the reporting period	
Patients with a visit in last 3 months	
Number of epilepsy patients with no seizures since last visit (in the last 3 months)	
Number of epilepsy patients hospitalized since last visit (in the last 3 months)	

MENTAL HEALTH	
Patients enrolled and active in care[1]	
Patients newly registered during reporting period	
Patients who have defaulted[2] during the reporting period	
Patients with a visit in last 3 months	
Patients hospitalized since last visit (in the last 3 months)	
Patients on medication who reported side effects at the last visit (in the last 3 months)	
Patients in care that were reported as stable at last visit (in the last 3 months)	

DIABETES	
Currently enrolled patients that have ever experienced a complication[3]	
Type 1 patients enrolled and active in care[1]	
Type 1 patients newly registered during reporting period	
Type 1 patients who have defaulted[2] during the reporting period	
Type 2 patients enrolled and active in care[1]	
Type 2 patients newly registered during reporting period	
Type 2 patients who have defaulted[2] during the reporting period	
Type 1 patients with visit in last 3 months	
Type 2 patients with visit in last 3 months	
Type 1 patients with a visit in the last three months, with FBS (<=7mmol/l or <=126 mg/dL)	
Type 2 patients with a visit in the last three months, with FBS (<=7mmol/l or <=126 mg/dL)	
Type 2 patients on [long-acting or short-acting] Insulin	

COPD	
Patients newly registered during reporting period	
Patients enrolled and active in care[1]	
Patients who have defaulted[2] during the reporting period	
Patients with a visit in last 3 months	

☐ *TICK IF PARTNER DATA INCLUDED*
Partner Name(s):

Report filled by:
Date:
Phone:

Incharge Signoff:
Date:
Phone:

Coordinator Signoff:
Date:
Phone:

1. ***Active in care**: patients that do NOT have an outcome of discharge, defaulted, stopped Tx, transferred out, death at the end of reporting period*
2. ***Defaulted**: patients who have an outcome of default OR have NOT had a visit >8 weeks past a missed visit*
3. ***Complications**: this includes cardiovascular disease, retinopathy, renal disease, stroke/TIA, PVD, neuropathy, sexual dysfunction*

Sept 2018

Appendix 8. NCD Register

Neno NCDs Register

Register Number:	
Facility Name:	
Facility Code:	
District:	
Date Register Started:	
Date Register Closed:	

Neno District Health Sector
Version – November 2018

How to Use this Register

Use this register when enrolling new clients in the Chronic Care Program

Start a new page for each new month. Write the month and year on top of every page.

Registration Date: Write the date the client is enrolled in the program in the format given i.e. dd/mm/yyyy

NCD Identifier: Write the NCD identifier number given to the client. The CCC number is composed of the facility code, patients number in that order

First Name: Write the first name of the client

Surname: Write the last name of the client

Sex: Circle the sex of the client. Circle *M for Male ,FNP for Female Non-pregnant, and FP for Female pregnant)*

Age: Write the age of the client in years. For clients less than 1 years write number of months and indicate months e.g. *11 mnths*

Age category: Circle the age category of the client. For clients below 15 years circle <1 and for those 15 years or above cricle 15+

Home Address

Village: Write the village of the client

T/A: write down the Traditional Authority the client resides

District: Indicate the district the client is coming form

Referral from: Circle where the client is referred from: OPD for Outpatient Department, InPt for Inpatient Department, Com for Community events, T/I for clients transferred in from other facilities, PC for clients transferred in from Palliative Care, and Other for Other

HIV status: Circle the HIV status of the client. For Non-reactive circle "NR", for Unknown circle "Unk" and for HIV reactive clients circle "R" and write the ART Registration number.

Diagnosis: Tick a box that represent the type of the NCD the client is diagnosed with and date of diagnosis. For mental illness and other indicate the type in the lined space provided and include date.

Outcome: Indicate the outcome in the program of the client by ticking the boxes in the column that relate to the clients outcomes. For discharged clients, indicate where they have been discharged.

Outcome date: Write down the date the outcome above took place

Page Summary: Write down the page totals in these boxes

Month Total: At the end of each month write down month totals in these boxes. Leave blank if page ends before the end of the month

Neno Non-Communicable Diseases (NCD) Register

Date page started: **Month** / **Year**

	Registration Date			NCD Identifier	First name	Surname	Sex			Age at enrollment	Age Cat		Home Address			Referred From					HIV Status			
	Day	Month	Year				Male	Female Non-Pregna	Female Pregnant		Below 15 yrs	15 yrs or older	Village	T/A	District	Outpatient (OPD)	Inward/Inpatient	Community	Transferred In	Palliative Care	Non Reactive	Unknown *refer testing*	Reactive	ART Reg. Number
1							M	FNP	FP		<15	15+				OPD	InPt	Com	T/I	PC	NR	Unk	R	
2							M	FNP	FP		<15	15+				OPD	InPt	Com	T/I	PC	NR	Unk	R	
3							M	FNP	FP		<15	15+				OPD	InPt	Com	T/I	PC	NR	Unk	R	
4							M	FNP	FP		<15	15+				OPD	InPt	Com	T/I	PC	NR	Unk	R	
5							M	FNP	FP		<15	15+				OPD	InPt	Com	T/I	PC	NR	Unk	R	
6							M	FNP	FP		<15	15+				OPD	InPt	Com	T/I	PC	NR	Unk	R	
7							M	FNP	FP		<15	15+				OPD	InPt	Com	T/I	PC	NR	Unk	R	
8							M	FNP	FP		<15	15+				OPD	InPt	Com	T/I	PC	NR	Unk	R	
9							M	FNP	FP		<15	15+				OPD	InPt	Com	T/I	PC	NR	Unk	R	
10							M	FNP	FP		<15	15+				OPD	InPt	Com	T/I	PC	NR	Unk	R	
11							M	FNP	FP		<15	15+				OPD	InPt	Com	T/I	PC	NR	Unk	R	
12							M	FNP	FP		<15	15+				OPD	InPt	Com	T/I	PC	NR	Unk	R	
13							M	FNP	FP		<15	15+				OPD	InPt	Com	T/I	PC	NR	Unk	R	
14							M	FNP	FP		<15	15+				OPD	InPt	Com	T/I	PC	NR	Unk	R	
15							M	FNP	FP		<15	15+				OPD	InPt	Com	T/I	PC	NR	Unk	R	
16							M	FNP	FP		<15	15+				OPD	InPt	Com	T/I	PC	NR	Unk	R	
17							M	FNP	FP		<15	15+				OPD	InPt	Com	T/I	PC	NR	Unk	R	
18							M	FNP	FP		<15	15+				OPD	InPt	Com	T/I	PC	NR	Unk	R	
19							M	FNP	FP		<15	15+				OPD	InPt	Com	T/I	PC	NR	Unk	R	
20							M	FNP	FP		<15	15+				OPD	InPt	Com	T/I	PC	NR	Unk	R	
						Page Summary																		
						Field Number	*1*	*2*	*3*		*4*	*5*				*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	

Version Oct 2018

Neno Non-Communicable Diseases (NCD) Register

Diagnoses																																							Outcome Date			
	Date HTN Diagnosis					Date DIA Diagnosis					Date Asthma Diagnosis					Date COPD Diagnosis					Date Epilepsy Diagnosis					Date MH Diagnosis					Date CHF Diagnosis					Date CKD Diagnosis					Date Other Diagnosis					Outcome								
	Hypertension	Advance NCD	*Day*	*Month*	*Year*	Diabetes - Type 1	Diabetes - Type 2	Advance NCD	*Day*	*Month*	*Year*	Asthma	Advance NCD	*Day*	*Month*	*Year*	COPD	Advance NCD	*Day*	*Month*	*Year*	Epilepsy	Advance NCD	*Day*	*Month*	*Year*	Mental Health	Advance NCD	*Day*	*Month*	*Year*	Chronic Heart Failure	Advance NCD	*Day*	*Month*	*Year*	Chronic Kidney	Advance NCD	*Day*	*Month*	*Year*	Other NCD	Advance NCD	*Day*	*Month*	*Year*	Died	Defaulted	Transferred Out	Stopped Treatment	Discharged	Discharges to?	*Day*	*Month*	*Year*	
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