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Developing a Health Facility Capacity Assessment Tool for
Cardiovascular Disease Management in Lao People's Democratic Republic

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Abstract

Developing a Health Facility Capacity Assessment Tool for
Cardiovascular Disease Management in Lao People's Democratic Republic

By Natsuko Tokieda

Background: In Lao People's Democratic Republic (PDR), cardiovascular diseases (CVDs) have become a huge burden, accounting for 22% of all deaths in 2014. According to the World Health Organization (WHO), the most cost-effective management of CVD in low- and middle-income countries (LMICs) is through prevention at the primary healthcare level. The WHO developed the Package of Essential Noncommunicable Disease Interventions (WHO PEN) for primary healthcare in low-resource settings with protocols for CVD management, which Lao PDR has recently adapted. Assessing the capacity of health facilities to implement CVD interventions is needed as the country prepares for scaling up these measures.

Purpose: The purpose of this study was to design, pilot, and evaluate an assessment tool for CVD management capacity in health facilities aimed at identifying the current status of CVD management and its barriers in Lao PDR.

Methods: The assessment tool included two components, a health facility questionnaire and a medical chart review tool. It covered CVD interventions of the WHO PEN protocol and WHO's six building blocks of the health system. The pilot test was conducted at three facilities, and descriptive analyses were conducted on pilot data.

Results: The tool was useful for collecting information on human resources, essential medicines and equipment for CVD, and out-of-pocket medical costs. Data on utilization and quality of care could not be thoroughly collected due to the current status of facilities' health information systems and limitations of the questionnaire. The medical chart review tool could not be used to its fullest potential due to the lack of individual medical records for outpatients at health facilities.

Discussion: This pilot study revealed several gaps related to the tool itself and the capacity of health facilities. At the tool level, questions related to clinical practice among healthcare providers needed improvement. At the health facility level, major gaps were identified in health information systems, which precluded a thorough assessment of health utilization.

Conclusion: While designed and piloted in the context of Lao PDR, this assessment tool has the potential for deployment in any other LMICs considering the expansion of CVD interventions.

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Definition of Terms

Cardiovascular Diseases (CVDs): This category of diseases refers broadly to problems of heart functions. In this thesis, the term CVD is defined to include all types of diseases that affect the heart or blood vessels, as defined by the National Heart, Lung, and Blood Institute (NHLBI). CVDs include coronary heart disease, stroke, congenital heart defects and peripheral artery disease (WHO, 2011).

Premature mortality/death: Refers to deaths in the population before the age of 70 years (Development, 2009).

Health Facility Capacity Assessment Tool: The tool was developed in this study, and consisted of both health facility questionnaire and medical chart review tool.

Abbreviations

BP: Blood Pressure

CVD(s): Cardiovascular disease(s)

DALYs: Disability-Adjusted Life Years

DH: District Hospital

DHIS2: District Health Information System 2

DM: Diabetes Mellitus

EHRs: Electronic Health Records

EHSP: Essential Health Service Package

EML: List of Essential Medicines of Lao PDR, 2015

GDP: Gross Domestic Product

HEARTS: HEARTS technical package

HT: Hypertension

ICD-10: International Classification of Disease-10

Lao PEN: Package of Essential Noncommunicable Disease interventions for primary healthcare in Lao PDR

M&E: Monitoring and Evaluation

MDGs: Millennium Development Goals

MOH: Ministry of Health

NCD(s): Noncoummunicable Disease(s)

PH: Provincial Hospital

SARA: Service Availability and Readiness Assessment

SDGs: Sustainable Development Goals

STEPS: STEPwise approach to Surveillance

UHC: Universal Health Coverage

WHO PEN: WHO Package of Essential Noncommunicable Disease interventions for primary healthcare in low-resource settings

Chapter 1 Introduction

1-1 Introduction and Rationale

Globally, the leading causes of death have been dramatically changing based on economic development, advances in medical technology, and the implementation of public health programs over the past twenty years. Of the 56.9 million global deaths in 2015, 39.5 million, or 70%, were due to noncommunicable diseases (NCDs). The disease burden is rising inequitably among lower income countries and populations. Lao People's Democratic Republic (Lao PDR) also faces similar disease burdens, and the most current report from 2015 indicates that 55% of total deaths were from NCDs in all ages and both sexes (WHO, 2017b). In particular, Cardiovascular Disease (CVD) has become a huge burden, and 22% of total deaths were caused by CVD in 2014 (WHO, 2018d).

Because of this NCD burden, the World Health Organization (WHO) issued a Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020 in 2013 (updated from an earlier version released for 2008-2013). This plan suggests cost-effective interventions for the prevention and control of NCDs, ones that give a good return on investment, generating one year of healthy life for a cost that falls below the gross domestic product (GDP) per person, and are affordable for all countries (WHO, 2013a). The action plan focuses on four types of NCDs: CVD, cancer, chronic respiratory disease, and diabetes, a set of diseases that share behavioral risk factors like tobacco use, unhealthy diet, physical inactivity, and harmful use of alcohol. The action plan consists of ideal policy options for member states and actions for the WHO secretariat. Countries are encouraged to adopt or adapt these policy options to their local context. In an effort to provide technical assistance to countries in integrating NCD intervention in their health care systems, the WHO issued the Package of

Essential Noncommunicable Disease interventions (WHO PEN) for primary health care in low resource settings in 2010. WHO PEN is an action-oriented set of cost-effective intervention protocols. The tool should enable early detection and management of the four main NCDs to prevent life threatening complications. The WHO PEN includes four protocols. Protocol 1"prevention of heart attacks, strokes and kidney disease through integrated management of diabetes and hypertension" and Protocol 2 "health education and counseling on healthy behavior" are related to CVD prevention and control (WHO, 2013b).

In the case of Lao PDR, CVD has contributed the most toward the NCD burden, and evidence-based interventions are available from WHO PEN's Protocols 1 and 2. Additionally, the WHO has recently issued the HEARTS technical package (HEARTS) in 2018 to support CVD interventions of the WHO PEN protocols. The HEARTS technical package offers a framework for implementing the integrated management of CVDs in the WHO PEN, which includes the minimum standard for CVD management in low- and middle-income countries (LMICs) (WHO, 2018a).

Before implementing CVD interventions under WHO PEN, assessing the capacity of health facilities to deliver these interventions is key. WHO states that the delivery of effective NCD interventions is determined by the capacity of the health-care systems (WHO, 2010a). Therefore, assessments of capacity should cover the functions of each building block of the health system. The WHO issued a health system framework (WHO, 2010b) which includes six core components, or building blocks, for a health system: service delivery, health workforce, health information systems, access to essential medicines, financing, and leadership/governance. The ultimate goal of enhancing the blocks is to improve health outcomes, equity, social and financial risk protection, responsiveness, and efficiency.

Lao PDR also announced a multisectoral action plan for the prevention and control of NCDs 2014-2020 in 2014. The goal is to reduce premature deaths and disability from the four main NCDs and reduce the prevalence of four of their shared behavioral causes. In the action plans, it is clearly mentioned that the government is to promote CVD management using the WHO PEN guidelines. Hence, the Package of Essential Noncommunicable Disease Interventions for primary healthcare in Laos (Lao PEN) was created in 2015 based on the WHO PEN (WHO, 2013b). Core interventions of the Lao PEN protocol consisted of five components: healthy lifestyle counseling, blood pressure control, cholesterol control, diabetes management and follow up (Health, n.d.-b). The Lao PEN has not actively expanded these services in any other regions after completing the pilot project in Champasack province, 2015, and the reasons for this have not been identified.

Overall, NCD management in Lao PDR has faced multiple barriers whether relates to the introduction of cost-effective interventions, high technology requirements, health financing schemes, primary healthcare workforce, or incorporating NCD management in primary care (WHO, 2010c). Outside the field of NCDs, an assessment of maternal and reproductive health services was conducted in the country by the United Nations in 2015. The Country Analysis Report identified five barriers, which were; quality and skill level of health staff, financial barriers for service accessibility, health governance, and health service delivery. It is possible that Lao PDR may be facing similar barriers in the context of CVD management, although the specific reasons for failing to expand the Lao PEN were not revealed. Because there is not enough information on existing problems facing the scale-up of CVD interventions in the country, it is essential to conduct a specific assessment of the capacity of health facilities for

CVD management. This step is necessary to promote comprehensive CVD interventions in Lao PDR.

Existing assessment tools each have their own purpose and components, and none are fully comprehensive or specific for CVD management. Thus, developing an integrated assessment tool that is specific for CVD management would be useful in understanding the current situation among health facilities and enhancing effective CVD interventions in Lao PDR and surrounding LMICs.

1-2 Problem Statement

CVD management with Lao PEN has not been promoted efficiently in Lao PDR, and there is no information assessing the capacity of CVD management among health facilities in the country. CVDs are asymptomatic in early stages and after diagnosis long-term follow-up and expensive high-technology interventions are required for treatment if the stage of the disease is advanced. Therefore, effective interventions for CVDs focusing on prevention at primary health care settings are necessary to reduce the significant burden of CVD on people, national health system, and country economic status and development.

1-3 Purpose Statement

In an effort to identify the current status of CVD management and barriers for implementing effective CVD interventions in Lao PDR and other LMICs, we developed and piloted a health facility capacity assessment tool for CVD management. The tool encompasses two components: health facility questionnaire and medical chart review tool.

1-4 Objectives

The objectives of this work were to: 1) design and develop a health facility capacity assessment tool to assess CVD management at primary health care settings in Lao PDR and

surrounding LMICs, 2) conduct a pilot test to evaluate the usefulness of the tool, 3) identify gaps in the CVD management capacities of health facilities, and 4) recommend revisions to the tool and to the health facilities as a result of the pilot.

1-5 Significance Statement

Improving CVD interventions at health facilities leads to alleviation of disease burden and improvement in quality of lives among affected people. NCDs, including CVDs, reduce productivity and contribute to poverty, create a significant burden on health systems, and lead to a growing economic burden on national economies (WHO, 2010a). Additionally, CVDs have specific characteristics that further aggravate this burden, including that CVDs are to a large extent incurable and affected people live with their disease for a long period of time. This means that long-term interventions would require large amounts of money to be spent, but prevention of CVDs would actually save governments money in the long term. Against the negative impacts of NCDs, priority has to be given for implementing interventions that have a low cost but high impact and provide a good return on investment. Regarding CVD, it has been estimated that a regimen of aspirin, statin and blood pressure-lowering agents may significantly reduce the risk of death from CVD in people at high cardiovascular risk. Providing such a regimen to those eligible between 40–79 years of age has been estimated to avert about one fifth of cardiovascular deaths in the next 10 years, with 56% of deaths averted in people younger than 70 years. With effective management, the average yearly cost per head of implementing such a regimen has been estimated to range from US$ 0·43 to US$ 0·90 in low-income countries (Lim et al., 2007).

Chapter 2 Literature Review

2-1 Epidemiological transition in causes of death and CVD burden in global settings and in Lao PDR

2-1-1 Global epidemiological transition in causes of death and burden of CVD

Globally, leading causes of death are dramatically changing due to economic development, advances in medical technology and implementation of public health programs for particularly over the last 20 years. These changes have brought improvements in infant mortality rates, leading to a prolonged life expectancy (Fuster, 2014). On the other hand, population ageing and socio-economic changes in the distribution of risk factors have accelerated the NCDs share of the total disease burden in many countries. Of 56.9 million global deaths in 2015, 39.5 million, or 70%, were due to NCDs. The four main NCDs consist of CVD, cancer, diabetes and chronic lung disease. The disease burden is rising inequitably among lower income countries and populations. In 2016, over three quarters of NCD deaths, which was 31.5 million people, occurred in LMICs with about 46% of deaths occurring before the age of 70 years. The leading causes of NCD deaths in 2016 were: CVD, resulting in17.9 million deaths of all NCD deaths, cancer, 9.0 million of all NCD deaths, respiratory diseases (including asthma and chronic obstructive pulmonary disease), 3.8 million of all NCD deaths, and diabetes, causing another 1.6 million deaths (WHO, 2019).

Globally, CVD is the single most important cause of death. To better capture the burden of a disease like CVD, which requires long-term follow-up and results in significant disability and mortality, a metric such as the disability-adjusted life years (DALYs) is more useful than individual measures of mortality and morbidity. The DALY is the sum of years lost due to premature death (YLLs) and years lived with disability (YLDs), making it a measure of years of

healthy life lost. In 2017, CVD led to 366 million DALYs lost, which amounts to 15% of all DALYs lost that year. Like many high-income countries during the past century, now LMICs are seeing an alarming and accelerating increase in CVD rates (Exchange, 2017).

2-1-2 Country profile of Lao PDR

The Lao PDR is a landlocked, ethnically diverse, mountainous and low population-density country with an estimated population of 6.5 million and a total area of 236,800 km. The country is a lower-middle-income economy with a gross national income per capita of US$1660 in 2014. As one of the fastest-growing economies in the WHO Western Pacific Region, it is likely to meet the criteria for graduation from the status of "least-developed country" by 2020. Gross domestic product (GDP) growth averaged almost 8% over the last decade. Economic growth strongly relies on use of the country's natural resources, especially mining, timber and hydropower. The Lao PDR ranked 141 of 188 countries on the Human Development Index in 2015 (UNDP, 2015).

Despite this growth, health indicators remain poor. A few Millennium Development Goals (MDGs) remained off track, most importantly the MDG on nutrition, with an estimated 44% of children under 5 years being stunted and 27% underweight in 2012. The under-5 mortality rate was 67 per 1000 live births, making MDG 4 (reduce child mortality) off track in 2015. The Lao PDR continues to face repeated outbreaks of all major communicable diseases. Progress has been uneven, with remote areas and ethnic groups struggling to achieve improved health status. Public spending on health is also very low compared to other countries. Financial sustainability remains an issue as service delivery is still dependent on out-of-pocket expenditure and less than 30% of the population is covered by health insurance. That said, an attempt to introduce universal health coverage (UHC) was piloted in 2018. The Lao Health Sector Reform

2013–2025 provides a road map to achieve an elastic health system and UHC by 2025, including a subsequent increase of domestic spending on health (WHO, 2017a).

2-1-3 Overall burden of CVDs in Lao PDR

In Lao PDR, the most current report of 2015 indicates that 55% of total deaths are from NCDs in all ages and both sexes (WHO, 2017b). In particular, CVD has become a huge burden, and 22% of total deaths were caused by CVD in 2014 (WHO, 2018d). Laos STEPwise approach to Surveillance (STEPS) 2013 indicates an increase in modifiable behavioral risk factors like tobacco use, unhealthy diet, lack of physical activity, and harmful use of alcohol, which in turn lead to overweight and obesity, raised blood pressure, and raised cholesterol, and ultimately disease, among people. For instance, the percentage of males who currently smoke tobacco products daily and the percentage of females who currently drink alcohol were found to increase in a comparison of 2008 and 2013 (WHO, 2008, 2013d).

Regarding the disease burdens in Lao PDR, top four causes of DALYs in 2017 were neonatal disorders, stroke, lower respiratory infections, and ischemic heart disease (I. f. H. M. a. Evaluation, 2017). The causes that were in the 10 leading causes of DALYs in 2017 but not 1990 were cerebrovascular disease, major depressive disorder, road injury, and neonatal encephalopathy (birth asphyxia and birth trauma). The DALYs clearly show us that NCDs, specifically CVD and related diseases, have a large negative impact on health and quality of life among people in Lao PDR now and for the future.

2-2 Global action for the prevention and control of NCDs and technical guidelines for CVDs

Some high-income countries have already faced the burden of NCDs before, and they took measures for NCDs and improved life expectancies by investing in disease management appropriately. However, LMICs cannot handle the issues proactively because of their economic

status, weak health systems, and the dual burden of communicable, maternal and childhood diseases. In the world, two billion people are living below the poverty line, and poverty and NCDs are linked by several pathways. Although providing good quality care for the poor is an ethical imperative, people around the world do not have access to or receive the services they need due to weak health systems, inadequate health-care budgeting, and unaffordable out-of-pocket expenditures (WHO, 2010c).

2-2-1 Sustainable Development Goals (SDG) Agenda

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared strategy for peace and prosperity for people and the planet, now and into the future. At its essence are the 17 SDGs, which are an urgent call for action by all countries in a global partnership. Goal 3, ensuring healthy lives and promote well-being for all at all ages, is relevant to NCDs. It has explicit targets on reducing premature mortality from NCDs, prevention of harmful use of alcohol and tobacco, reducing the number of global deaths and injuries from road traffic accidents, achieving universal health coverage, and supporting research for NCDs (Nations, 2018).

2-2-2 WHO Global Action Plan for the Prevention and Control of NCDs

Right before the SDG era, the WHO issued the Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020 in 2013 (updated from an earlier version released for 2008-2013). This plan suggests cost-effective interventions for the prevention and control of NCDs, ones that give a good return on investment, generating one year of healthy life for a cost that falls below the GDP per person, and are affordable for all countries (WHO, 2013a). The action plan focuses on four types of NCDs: CVD, cancer, chronic respiratory disease, and diabetes, a set of diseases that share behavioral risk factors like tobacco use,

unhealthy diet, physical inactivity, and harmful use of alcohol. Scientific knowledge demonstrates that the NCD burden can be greatly reduced if cost-effective preventive and curative actions for NCDs which are already available are implemented in an effective and balanced manner (WHO, 2013a). Hence, this action plan shows an example of evidenced-based interventions for health system strengthening and reduction of risk factors related to CVD.

Health service-oriented interventions in the action plan, emphasize prevention, early detection, treatment and sustained management of people with the four types of NCD to prevent complications and reduce hospitalization, costly high-technology interventions, and premature deaths (WHO, 2013a). The people-centered primary health care, UHC, and social protection mechanisms are also important for sustainability of the plan.

Moreover, the action plan consists of ideal policy options for member states and actions for the WHO secretariat. The Global Action Plan was accompanied by the Global Monitoring Framework (GMF) (WHO, n.d.-a) which set a global target for heart disease and stroke management, which is that by 2025 at least 50% of eligible people should receive drug therapy and counseling (including glycaemic control) to prevent heart attacks and strokes (WHO, 2016a).

Countries are recommended to adopt these policy options and GMF targets and adapt them to their local context. In an effort to provide technical assistance to countries in integrating NCD intervention in their health care systems, the WHO issued WHO PEN for primary health care in low resource settings in 2010.

2-2-3 WHO PEN

WHO PEN is a minimum set of action-oriented interventions. It is a prioritized set of cost-effective interventions that can be delivered to an acceptable quality of care, even in resource-poor settings. It is meant to reinforce health system strengthening by contributing to the

building blocks of the health system necessary for scaling-up NCDs interventions. The tool should enable early detection and management of the four main NCDs to prevent life threatening complications (WHO, 2010c).

The WHO PEN was developed based on following essential perspectives for NCD management. Several approaches are needed to provide sophisticated medical services for NCDs and their complications. First, there should be more investment in prevention and primary care. Second, the cost of treating CVD, diabetes and chronic obstructive pulmonary disease can be reduced to a minimum by selecting critical evidence-based interventions. Third, the cost of treating complications of NCDs that require hospitalization such as heart attacks and strokes can be reduce (WHO, 2010c).

The WHO PEN includes four protocols (WHO, 2013b, pp. 14-25) :

Protocol 1: Prevention of heart attacks, strokes and kidney disease through integrated management of diabetes and hypertension

Protocol 2: Health education and counseling on healthy behaviors

Protocol 3-1: Management of asthma

Protocol 3-2: Management of chronic obstructive pulmonary disease

Protocol 4-1: Assessment and referral or women with suspected breast cancer at primary health care

Protocol 4-2: Assessment and referral of women with cervical cancer at primary health care.

In terms of cost-effective interventions for CVD management, health promotion and prevention interventions at an early stage are more cost effective than actual CVD treatment and have the potential to substantially reduce cardiovascular events. Providing primary prevention

using aspirin, statin and blood pressure-lowering agents to those eligible between 40–79 years of age has been estimated to avert about one fifth of cardiovascular deaths in the next 10 years, with 56% of deaths avoided in people younger than 70 years. For secondary prevention of CVD, which is prevention of recurrences and complications in those with established disease using aspirin, beta-blockers, angiotensin-converting enzyme inhibitors and lipid-lowering therapies lower the risk of recurrent cardiovascular events, including in those with diabetes (WHO, 2010a). Hence, the WHO PEN incorporated these evidence-based interventions for primary health care settings in LMICs.

Previous research showed how the WHO PEN interventions are cost effective. Basu, Wagner, Sewpaul, Reddy, and Davies (2019) calculated the DALYs from CVD or type 2 diabetes complications at current treatment levels versus WHO PEN using a simulated demographically representative population for South Africa. It demonstrated that the at the current treatment level the population showed a burden of 40.0 DALYs (95% CI 29.5-52.0) per 1000 population per year; whereas under the WHO PEN implementation the burden was 32.9 DALYs (24.4-44.7) per 1000 population. Additionally, the incremental cost effectiveness of conducting WHO PEN over current treatment would be saving of US$17,587 (95% CI 1840-42,589) per DALY averted (Basu et al., 2019).

2-2-4 WHO HEARTS

In addition to WHO PEN, the WHO newly issued in 2018 the HEARTS guideline to support CVD interventions of the WHO PEN protocols. The package includes six modules which are healthy-lifestyle counselling, evidence-based treatment protocols, access to essential medicines and technology, risk based charts, team-based care and system for monitoring implementation guide. One of the modules, risk based charts, has not been issued yet. As CVD is

clinically asymptomatic in the early stages, these tools should be used proactively to identify people at risk for developing CVDs and to improve the basic treatment for hypertension and diabetes to prevent CVDs with a targeted screening approach. The HEARTS technical package offers a framework for implementing the integrated management of CVDs in the WHO PEN, which includes the minimum standard for CVD management in LMICs. The HEARTS enhances implementation of the WHO-PEN protocol 1 and 2 by providing the technical and operational outline and tools necessary for integrating CVD management into primary health care with an impact evaluation strategy. It also provides additional tools for training, patient and program monitoring and implementation, which was not covered by WHO PEN (WHO, 2018b). Therefore, the HEARTS package should be considered simultaneously with protocols 1 and 2 in WHO PEN.

2-3 Health System Strengthening and CVD management in LMICs

When evaluating health service capacity for CVDs at health facility level, we should cover the all component of the six building blocks of the health system. The WHO issued the health system framework (WHO, 2010b) which explains the six core components, or building blocks, of the health system. The blocks consist of service delivery, health workforce, health information systems, access to essential medicines, financing, and leadership/governance. The ultimate goal of enhancing the blocks is to improve health outcomes and equity, social and financial risk protection, responsiveness and efficiency. The WHO emphasizes the contribution of WHO PEN to the Health System Building Blocks (WHO, 2010c) (Table 1). WHO also states that the delivery of effective NCD interventions is determined by the capacity of health-care system (WHO, 2010a).

2-4 Current national action for CVD prevention and control in Lao PDR

Health sector Reform 2013-2025 described the current health status of the population in Lao PDR and defined direction and strategy for health sector reform as well as priorities for action (Health, 2016). Phase II from 2016-2020 is meant to provide basic health services while expanding financial protection. To achieve this, the Department of Health Care and Rehabilitation in the Ministry of Health is finalizing the Essential Health Service Package (EHSP) (Health, n.d.-a), which serves as a tool to guide the provision of a minimum set of priority public health and clinical services that must be delivered in the different types of health facilities and in the community. Out of the 144 services listed in the EHSP, 26 are supposed to target NCDs. Based on these streams, Lao PDR introduced the Lao PEN; however, further implementation plans remain uncertain.

Lao PDR announced a multisectoral action plan for the prevention and control of NCDs 2014-2020 in 2014. The goal is to reduce premature deaths and disability from four main NCDs and reduce the prevalence of four of their shared behavioral causes.

The objectives of the plan are (Health, 2014b, p. 11):

- To reduce the population prevalence of common factors for NCDs.
- To enhance coverage and quality of cost-effective interventions for early detection, treatment and palliative care.
- To monitor trends of NCDs and their risk factors and to evaluate the progress in NCD prevention and control.
- To strengthen governance, accountability and resources for NCD prevention and control.
- NCD prevention and control through healthy cities and settings.

In the action plan, it is clearly mentioned that the government is to promote CVD management using WHO PEN guideline.

The Lao PEN was created in the context of Lao PDR based on WHO PEN, and a pilot project was conducted in Champasack province in 2015. The purpose of the project was to introduce a defined set of services for NCD prevention and control adapting WHO PEN into target facilities, and its end-line evaluation showed positive perspectives for planning to scale up Lao PEN interventions nationwide (WHO, 2013b). However, the Lao PEN has not actively expanded these services in any other regions after completing a pilot project, and the reasons have not been identified.

Additional preventive efforts targeting cancers, liver cirrhosis and CVDs focused on the levels and patterns of tobacco and alcohol consumption. Hence, the Department of Hygiene and Health Promotion in the Ministry of Health ratified the WHO Framework Convention on Tobacco Control in 2006, passed the law on tobacco control in 2009 and established its fund in 2013 to increase taxes and prices on tobacco and alcohol products (Control, 2014).

2-5 Challenges in promoting CVDs management in Lao PDR

In general, numerous barriers for delivery of NCD interventions at the primary care level exist in low resource settings. Not all interventions can be integrated into “close-to-client” primary care facilities in resource-constrained settings. Apart from the lack of resources, there are many other reasons why the NCD management is not fully implemented. First, interventions available for some NCDs are not affordable. Second, high-technology facilities required for diagnosis and treatment may preclude the delivery of such interventions in primary care. Third, the health financing schemes may not be able to cover all NCD interventions. Fourth, the skills needed for delivery of all NCD interventions would be too complex to be learnt by the primary

health care workforce. Finally, as there are many competing priority conditions that countries need to address at the primary care level, it is unrealistic to expect LMICs to integrate care of all NCDs into primary care at once (WHO, 2010c).

Apart from NCDs, the Unites Nations assessed the current health service problems of maternal and reproductive health in their Country Analysis Report of Lao PDR in 2015. In the report, five problems were identified which included: quality and skill level of health staff, financial barriers for service accessibility, health governance, and health service delivery. In terms of quality of health staff, there were inadequate quality standards among health professionals because the lack of national licensing system. Regarding accessibility, the utilization of health services was quite low because of financial barriers among people. People are burdened by out-of-pocket expenses when seeking medical treatment. The inadequate governance led to insufficient management and logistics systems. For instance, only 58% of health facilities had child survival medicines in stock over a six-month period according to a survey in 2014. Moreover, the overall strategy for health service delivery including strengthening a basic service package, health human resources capacity, and health sector financing needed to be improved (PDR, 2015). Although these analyses focused on the status of health services for maternal and reproductive health in Lao PDR, they are likely applicable to CVD management as well. Hence, Lao PDR can be assumed to face the similar barriers for CVD management although the specific reasons for failing to expand the Lao PEN remains unclear.

In conclusion, there is not enough information on existing problems facing the scale-up of CVD interventions in the country. As such, it is essential to conduct a specific assessment of the capacity of health facilities for CVD management. This step is necessary to promote comprehensive CVD interventions in Lao PDR.

2-6 Comprehensive CVD Assessment Tool in LMICs

An important preliminary step of integrating the WHO PEN into primary care is to evaluate the capabilities of the health infrastructure to implement the WHO PEN. Thus, data should be collected on the health facilities providing general health services including their available resources and the access to and the utilization of the health services by the population (WHO, 2010c). There are exiting tools for assessing capabilities of health facilities. Examples include the PEN questionnaire, the HEARTS baseline facility assessment template, among others. A brief overview of these tools is described below.

2-6-1 PEN sample questionnaire

The WHO developed a questionnaire for WHO PEN and recommended using it before launching the WHO PEN interventions (WHO, n.d.-c) (Appendix 1). It focuses on assessing the capacity to prevent and manage major NCDs in primary care facilities in LMICs. It consists of human resources, equipment, infrastructure/services, medicines, utilization of services, referral of patients, record keeping/medical information system, financing and administration, and community links. The purpose of this questionnaire is to apply WHO PEN into LMICs, so some questions are too specific and others are somewhat broad. Additionally, the questions are limited when it comes to identifying CVD service delivery issues in detail.

2-6-2 HEARTS baseline facility assessment template

This assessment tool is almost same contents as PEN sample questionnaire, and there are few specific questions assessing CVD interventions duplicated from PEN questions (WHO, 2018b) (Appendix 2).

2-6-3 Service Availability and Readiness Assessment (SARA)

SARA (WHO, 2013c) is a health facility assessment tool designed by WHO to assess and monitor the service availability and readiness of the health sector and to generate evidence to support the planning and managing of a health system. The questionnaire covers staffing, inpatient and observation beds, infrastructure, available services, diagnostics, medicines and commodities and interviewer's observations. In the available services, there are nineteen questions related to NCDs and seven questions are relevant to CVDs in them. The assessment tool is more detailed than PEN and HEARTS tool, but CVD questions are pretty broad and many questions are not necessary for CVD capacity assessment.

2-6-4 NCD Country Capacity Tools

This tool assists countries in identifying key opportunities and gaps in NCD capacity and workforce training, surveillance, advocacy, planning, and evidence-based prevention strategies to help. There are six components, which are demographic indicators and NCD burden, health system and prevention and primary care, workforce and capacity building, planning and policy and program management, resources and partnerships (Quevedo, Lobelo, Cadena, Soares, & Pratt, 2017). These tools assess the capacity of country level not focusing on health facility level. However, some of questions are useful to identify the gap for CVD management in health facilities. The WHO has also developed a similar tool (REF: https://www.who.int/ncds/surveillance/ncd-capacity/en/)

In summary, each of the existing assessment tools has its own purpose and components, and none is fully comprehensive and specific to issues related to CVD management in LMICs. Therefore, it is important to develop a comprehensive tool that builds on existing tools and integrates questions from them related to assessing CVD management capacity. Such integrated

assessment and CVD-specific assessment tool would be useful for understanding the current situation of health facilities in Lao PDR and enhancing effective CVD interventions in the country. This is the focus of this thesis.

Chapter 3 Manuscript

3-1 Abstract

Background: In Lao People's Democratic Republic (PDR), cardiovascular diseases (CVDs) have become a huge burden, accounting for 22% of all deaths in 2014. According to the World Health Organization (WHO), the most cost-effective management of CVD in low- and middle-income countries (LMICs) is through prevention at the primary healthcare level. The WHO developed the Package of Essential Noncommunicable Disease Interventions (WHO PEN) for primary healthcare in low-resource settings with protocols for CVD management, which Lao PDR has recently adapted. Assessing the capacity of health facilities to implement CVD interventions is needed as the country prepares for scaling up these measures.

Purpose: The purpose of this study was to design, pilot, and evaluate an assessment tool for CVD management capacity in health facilities aimed at identifying the current status of CVD management and its barriers in Lao PDR.

Methods: The assessment tool included two components, a health facility questionnaire and a medical chart review tool. It covered CVD interventions of the WHO PEN protocol and WHO's six building blocks of the health system. The pilot test was conducted at three facilities, and descriptive analyses were conducted on pilot data.

Results: The tool was useful for collecting information on human resources, essential medicines and equipment for CVD, and out-of-pocket medical costs. Data on utilization and quality of care could not be thoroughly collected due to the current status of facilities' health information systems and limitations of the questionnaire. The medical chart review tool could not be used to its fullest potential due to the lack of individual medical records for outpatients at health facilities.

Discussion: This pilot study revealed several gaps related to the tool itself and the capacity of health facilities. At the tool level, questions related to clinical practice among healthcare providers needed improvement. At the health facility level, major gaps were identified in health information systems, which precluded a thorough assessment of health utilization. Conclusion: While designed and piloted in the context of Lao PDR, this assessment tool has the potential for deployment in any other LMICs considering the expansion of CVD interventions.

3-2 Introduction

Globally, the leading causes of death have been dramatically changing based on economic development, advances in medical technology, and the implementation of public health programs over the past twenty years. Of the 56.9 million global deaths in 2015, 39.5 million, or 70%, were due to noncommunicable diseases (NCDs). The disease burden is rising inequitably among lower income countries and populations. Lao People's Democratic Republic (Lao PDR) also faces similar disease burdens, and the most current report from 2015 indicates that 55% of total deaths were from NCDs in all ages and both sexes (WHO, 2017b). In particular, Cardiovascular Disease (CVD) has become a huge burden, and 22% of total deaths were caused by CVD in 2014 (WHO, 2018d).

Because of this NCD burden, the World Health Organization (WHO) issued a Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013-2020 in 2013 (updated from an earlier version released for 2008-2013). This plan suggests cost-effective interventions for the prevention and control of NCDs, ones that give a good return on investment, generating one year of healthy life for a cost that falls below the gross domestic product (GDP) per person, and are affordable for all countries (WHO, 2013a). The action plan focuses on four types of NCDs: CVD, cancer, chronic respiratory disease, and diabetes, a set of

diseases that share behavioral risk factors like tobacco use, unhealthy diet, physical inactivity, and harmful use of alcohol. The action plan consists of ideal policy options for member states and actions for the WHO secretariat. Countries are encouraged to adopt or adapt these policy options to their local context. In an effort to provide technical assistance to countries in integrating NCD intervention in their health care systems, the WHO issued the Package of Essential Noncommunicable Disease interventions (WHO PEN) for primary health care in low resource settings in 2010. WHO PEN is an action-oriented set of cost-effective intervention protocols. The tool should enable early detection and management of the four main NCDs to prevent life threatening complications. The WHO PEN includes four protocols. Protocol 1"prevention of heart attacks, strokes and kidney disease through integrated management of diabetes and hypertension" and Protocol 2 "health education and counseling on healthy behavior" are related to CVD prevention and control (WHO, 2013b).

In the case of Lao PDR, CVD has contributed the most toward the NCD burden, and evidence-based interventions are available from WHO PEN's Protocols 1 and 2. Additionally, the WHO has recently issued the HEARTS technical package (HEARTS) in 2018 to support CVD interventions of the WHO PEN protocols. The HEARTS technical package offers a framework for implementing the integrated management of CVDs in the WHO PEN, which includes the minimum standard for CVD management in low- and middle-income countries (LMICs) (WHO, 2018a).

Before implementing CVD interventions under WHO PEN, assessing the capacity of health facilities to deliver these interventions is key. WHO states that the delivery of effective NCD interventions is determined by the capacity of the health-care systems (WHO, 2010a). Therefore, assessments of capacity should cover the functions of each building block of the

health system. The WHO issued a health system framework (WHO, 2010b) which includes six core components, or building blocks, for a health system: service delivery, health workforce, health information systems, access to essential medicines, financing, and leadership/governance. The ultimate goal of enhancing the blocks is to improve health outcomes, equity, social and financial risk protection, responsiveness, and efficiency.

Lao PDR also announced a multisectoral action plan for the prevention and control of NCDs 2014-2020 in 2014. The goal is to reduce premature deaths and disability from the four main NCDs and reduce the prevalence of four of their shared behavioral causes. In the action plans, it is clearly mentioned that the government is to promote CVD management using the WHO PEN guidelines. Hence, the Package of Essential Noncommunicable Disease Interventions for primary healthcare in Laos (Lao PEN) was created in 2015 based on the WHO PEN (WHO, 2013b). Core interventions of the Lao PEN protocol consisted of five components: healthy lifestyle counseling, blood pressure control, cholesterol control, diabetes management and follow up (Health, n.d.-b). The Lao PEN has not actively expanded these services in any other regions after completing the pilot project in Champasack province, 2015, and the reasons for this have not been identified.

Overall, NCD management in Lao PDR has faced multiple barriers whether relates to the introduction of cost-effective interventions, high technology requirements, health financing schemes, primary healthcare workforce, or incorporating NCD management in primary care (WHO, 2010c). Outside the field of NCDs, an assessment of maternal and reproductive health services was conducted in the country by the United Nations in 2015. The Country Analysis Report identified five barriers, which were; quality and skill level of health staff, financial barriers for service accessibility, health governance, and health service delivery. It is possible

that Lao PDR may be facing similar barriers in the context of CVD management, although the specific reasons for failing to expand the Lao PEN were not revealed. Because there is not enough information on existing problems facing the scale-up of CVD interventions in the country, it is essential to conduct a specific assessment of the capacity of health facilities for CVD management. This step is necessary to promote comprehensive CVD interventions in Lao PDR.

Existing assessment tools each have their own purpose and components, and none are fully comprehensive or specific for CVD management. Thus, developing an integrated assessment tool that is specific for CVD management would be useful in understanding the current situation among health facilities and enhancing effective CVD interventions in Lao PDR and surrounding LMICs.

3-3 Methods

The assessment tool comprised two components, the health facility questionnaire and a medical chart review tool. Developing and testing the tool comprised four steps: generating the conceptual framework, designing the two components, pilot-testing the tool, and making recommendations for tool revision and for health facilities. All steps were conducted under the supervision of the technical staff of the WHO in-country office. The developed tools were also reviewed and approved by the NCDs focal point at the Ministry of Health (MOH) of Lao PDR. Official approval from the MOH was obtained to pilot test the assessment tools at three health facilities in the country.

3-3-1 Generation of the conceptual framework for tool development

The initial purpose for developing this assessment tool was to identify issues that halted the national expansion of Lao-PEN. The assessment was designed to target two aspects: 1) the

current status of using Lao-PEN in the three health facilities which had already introduced Lao-PEN, and 2) overall CVD management status in Lao PDR. Hence, the assessment tool was created to assess not only service delivery but other components of the health system too. The conceptual framework was created to inform the questionnaire design and medical chart review tool of the study. The pillars of the framework were modeled around the WHO's six building blocks of the health system (WHO, 2010b). The main objective for each pillar was set to identify weaknesses and strengths to rolling out the Lao-PEN in other provinces in the country.

3-3-2 Preliminary design of the assessment tool

Based on the conceptual framework, the indicators within each pillar were identified through literature review. The review included grey literature developed by the WHO and Lao government, including the WHO's Global Action Plan for NCDs (WHO, 2013a), WHO-PEN (WHO, 2010c), WHO's health system building blocks (WHO, 2010b), and the Lao PDR national strategy for NCDs (Health, 2014b). The WHO has been guiding LMICs to manage NCDs using WHO-PEN, and the guideline has a survey tool for determining the country capacity for tackling NCDs (Appendix 1). The baseline WHO-PEN survey tool was sufficient to evaluate the entire heath system's capacity relevant to NCDs, but health service delivery at the health facility level was not fully assessed by the tool. Hence, the literature review was focused on using the health system building blocks to identify missing CVD management indicators from the existing baseline WHO-PEN survey tool. Moreover, additional indicators for health service delivery related to CVD suggested by WHO-PEN and HEARTS guidelines were also identified and added to the preliminary questionnaire.

3-3-3 Pilot testing the assessment tool

Under the direction of the WHO Laos country office, the Lao-PEN was initiated in Champasack province as a pilot project in June 2014. The project was monitored, and an evaluation was performed at the end of the pilot in October-December 2015. The overall interventions using Lao PEN were positively evaluated and recommended for national scale up, and essential medicines and equipment were distributed to target health facilities (WHO, n.d.-b). However, the status of the project and its national expansion after the pilot remained unclear. To better understand challenges in adopting Lao PEN, the Champasack province was selected to pilot test our assessment tool as it would allow us to evaluate both the current health system's capacity for CVD management and the usage of the Lao PEN guidelines at health facilities. In Lao PDR, health facilities are structured at three main levels: provincial hospitals, district hospitals, and health centers. For our pilot, we selected one health facility from each level within Champasack province and conducted the assessment in five days during July 2-6, 2018. The assessment team consisted of a focal person from the MOH, an administrative director of Champasack provincial hospital, three WHO staff and an Emory University researcher.

3-3-4 Identifying recommendations

Based on pilot study implementation and data analysis, a set of recommendations were issued at the level of the assessment itself – tool and data collection procedures – and at the level of health facilities and the broader health system in the Lao PDR.

3-4 Results

3-4-1 Generation of conceptual framework

Needs Assessment

Clearly, Lao PDR has been facing a high CVD disease burden and the challenge of a primary healthcare system that is insufficient for supporting CVD management. Toward this end, the division of 'Non-communicable Disease Control' was established in the Department of Health Care and Rehabilitation of MOH in 2017 and this was managed at the central government level. The division is expected to play a key role in supervising NCD management in the country. The MOH secures a specific budget for NCDs in its Five-Year Health Sector Development Plan (HSDP) totaling 2,554,500 USD for developing the NCD prevention and control plan in collaboration with other health and non-health sectors (Health, 2014a). Based on this plan, the Lao PEN was introduced for managing the burden of CVD. However, following its introduction, the Lao PEN program stopped making progress, and unfortunately there were no specific reasons identified for this lack of progress. There are two reasons assumed for why Lao PEN was not having an impact on CVD management. First, the health system did not have enough capability to manage CVDs appropriately. Second, the Lao PEN guideline and its operating plan were not sustainably. The purpose of this work was to determine the reasons why the CVD interventions using the WHO guidelines have not been sufficiently promoted, focusing on health-system barriers. The second purpose is to investigate the capability for CVD management in Lao PDR.

Conceptual Framework

This assessment tool was designed for assessing the capacity of CVD management in primary health care settings in Lao PDR, and is expected to be useful in other LMICs in the

future. The conceptual framework (Figure 1) was created to cover early interventions for hypertension, diabetes and high cholesterol based on the WHO-PEN protocols in the context of the six health-system building blocks. The survey questionnaire did not target the treatment of heart attacks, heart failure, strokes, and kidney disease because WHO PEN did not focus on these outcomes, and its protocol indicated that the patients who have these complicated conditions should be referred to secondary and tertiary care facilities.

The overall goal of this questionnaire was set, and objectives were developed for each pillar. The goal was to identify strengths and weaknesses for CVD service delivery and other pillars of the health system that relate to CVD management. Based on the results of the pilot study, the tool was to be further refined. The following data collection objectives were set; each corresponds to one of the six health-system building blocks, except for the one on Leadership and Governance. Because this survey was planned for health facilities, we excluded Leadership and Governance as this "building block" is more geared toward the central government level.

Objective 1: Determine the ability of medical staff to manage hypertension, diabetes mellitus and high cholesterol to prevent CVDs

Objective 2: Confirm the accessibility of essential medicines for CVDs at health facilities

Objective 3: Assess the capacity of preventive CVD management in health facilities

Objective 4: Confirm the presence of health information systems and assess their ability to inform CVD interventions

Objective 5: Assess the sustainability of CVD management and financial support for patients

Objective 6: Assess the current burden of cardiovascular risk factors and CVD outcomes in the patient population

3-4-2 Preliminary design of the facility assessment tool

The assessment tool was created based on the baseline facility assessment template of WHO-PEN, and further questions were added through literature review. The tool consisted of a facility questionnaire and a medical chart review. The purpose of the questionnaire was to assess the overall CVD management capacity for operating Lao-PEN at each facility level in Lao PDR. The health facility questionnaire included eight sections: characteristics of the facility, human resources, medicines/equipment/tests, quality of care, service utilization, referral of patients, record keeping/medical information system, and finance and administration. There were five components in the medical chart review tool, which were CVD/diabetes history, data for diagnosis, risk level estimation, CVD/diabetes treatment and CVD/diabetes follow up. In the medical chart review, we attempted to gain information on medical interventions of health providers to calculate an indicator (six-monthly control of blood pressure among people treated for hypertension) (WHO, 2018c) that HEARTS guideline recommended as an evaluation of CVD management. Also, the information in the charts was intended to confirm actual practices and health services delivered by the health professionals. The full questionnaire and the tool for medical chart review can be found in Appendix 3 and 4.

Literature Review

A literature review on CVD management in Lao PDR and global settings was conducted to further inform tool development. The specific objective for conducting this literature review was to identify the primary medical treatments and cost-effective interventions for CVDs and to identify additional indicators for assessing the health service delivery situation in Lao PDR, beyond those already included on the WHO-PEN baseline assessment tool.

a. Health facility functions and referral system

Because CVDs present as both acute and chronic conditions and pose long-term complications and disabilities, risk assessment, early detection and treatment of CVD should be enhanced at the primary health care settings in LMICs, and at the same time, referral systems to secondary and tertiary care facilities should be strengthened. Therefore, we included in the tool a component that assesses functions of the target facilities, and another set of questions that assesses screening for risk factors under the quality of care part (Appendix 3, Section D).

b. Required cost-effective interventions for CVDs in primary health care settings, LMICs

For primary prevention of coronary heart disease and stroke, individual health-care interventions can be targeted to those at high total cardiovascular risk or those with single risk factor levels. The HEARTS guideline indicated that the management of CVDs in the primary health care settings should focus on primary prevention by addressing major modifiable risk factors such as tobacco use and hypertension using a total cardiovascular risk approach. In addition, secondary prevention to avert repeated events in people with a CVD history also should be strengthened. Furthermore, it highlighted the need for referral system for acute manifestations of CVD, with prompt referral to the next level of care from primary care facilities (WHO, 2016b). Hence, we took into account in developing the tool the above characteristics of CVDs and included indicators related to the cost-effective interventions indicated in WHO PEN and HEARTS. The baseline facility assessment tool already existed in both WHO PEN and HEARTS guidelines, and were designed in line with six building blocks with similar questions. We based this assessment mostly on the HEARTS' tool because it is more specifically related to CVD management (Appendix 2).

Table 2 includes a summary of the literature review focusing on cost-effective interventions for CVD at the health service delivery level. The extracted information was based on the WHO "Best buys" (WHO, 2017c). The WHO recommends a set of 88 interventions to address NCDs as part of its Global Action Plan for the Prevention and Control of NCDs 2013-2020. Out of the 88 interventions, 16 are called "Best buys" because they are considered to be the most cost-effective interventions, having an average cost-effectiveness ratio of ≤ 1$100/DALY averted in LMICs (WHO, 2017c). Additionally, the descriptions of interventions recommended by PEN and HEARTS protocols relevant to the "Best buys" were added into the Table 2.

Hence, we included in the tool questions relevant to CVD interventions and "Best buys" under the health service delivery part. This would enable the tool to assess whether those interventions were implemented or not in the health facilities.

Facility Questionnaire Development

Based on the indicators identified by the literature reviews, the preliminary questionnaire was created (Appendix 3). Each section of this questionnaire is described below.

a. Characteristics of facility

In Lao PDR, there are three levels of health facilities, which are the provincial, district hospital, and health center. Depending on the classification of the facilities, there appear to be large limitations in CVD service delivery. As such, the purpose of this section was to establish basic information on the target facility. Additionally, one of the questions related to the presence of a NCD focal person present in the facility, information that might show the level of interest the facility has in treating NCDs, including CVDs. Identifying the focal person would also

facilitate requests for additional information such as missing data after completing the survey at the facility.

b. Human resources (Health Workforce)

This section pertained to staff allocation and in-service trainings. The questions were designed to collect information on the number of staff designated for CVD and DM management. Other questions focused on the number of years of nursing education (two and half years, three years, or bachelor level) and the number of nursing students who did their nursing practicum at the facility. Due to manpower shortages, nursing students seem to play an important role as members of the health staff in each facility; therefore, a question was added about nursing students. Moreover, because there is no licensure system for nurses in the country, we asked about the level of nursing education, as this would presumably affect the quality of care for CVD. Information on in-service training was also deemed important for evaluating skill level of staff and was added to the tool.

c. Medicines/Equipment/Tests (Access to Essential Medicine/Health Service Delivery)

This section used almost the same set of questions from the baseline facility assessment template of HEARTS. It inquired about the stock of essential medicine and equipment, and availability of tests for diagnosing CVDs and diabetes at the target facility. In the medicine component of the tool, there were questions on not only the stock of each medicine but also its supply chain. Regarding equipment and tests, questions assessed whether each equipment or test was functional at the period of data collection and inquired into its maintenance situation.

d. Quality of care (Health Service Delivery)

This section focused on cost-effective interventions for CVD, mainly hypertension and DM management through screening, diagnosis, treatment, and counseling and health education.

In Lao PDR, the government introduced the WHO PEN renamed Lao PEN through technical support from WHO, and the WHO PEN protocols were created based on the 'Best buys'. Thus, each question in the tool followed a specific protocol in the WHO PEN guideline, and these questions attempted to clarify the knowledge and practice around CVD interventions among healthcare providers. Answers to these questions would demonstrate how familiar medical staff were with the Lao PEN protocols and would gauge their level of knowledge about current best practices, a factor that affects the provision of health services to patients.

e. Service Utilization (Health Service Delivery)

This section used almost the same set of questions from the baseline facility assessment template of HEARTS. Questions intended to identify the number of patients who developed heart disease, hypertension and diabetes. The original tool focused on the number of patients with the particular disease who visited the facility the day before the survey. We assumed that there were few patients visiting the health center on a daily basis, so the questions were modified to ask about patient visits during the prior month.

f. Referral of patients (Health Service Delivery)

CVD referral questions covered the capability of referring a patient to a higher level facility and the method of transportation available. Questions were adopted or adapted from the HEARTS survey. If the response indicated, for example, a lack of emergency transportation, additional questions were asked to analyze the reason behind this gap.

g. Record keeping/Medical information system (Health Information Systems)

Monitoring patients' visits and recording their treatments are key for CVD management. Therefore, we developed a set of questions to understand individual medical record keeping and the information system for inventory control of medical supplies. The answer options were

designed to confirm both availability at the time of data collection and frequency of routine usage of the information or the system.

h. Financing and administration (Health Systems Financing)

The financing status sought to identify the coverage for medicines, consultations and diagnostic tests. In Lao PDR, the MOH experimentally introduced UHC, and NCD-related medicines, consultations and diagnostic tests were supposed to be offered for free at health facilities in 2018. The national health insurance basically covered the cost of drugs in the National List of Essential Drugs issued by Lao MOH in each level of facility which include the following nine essential medicines: aspirin, ACE inhibitor, beta-blockers, calcium channel blockers, statins, thiazide diuretics, metformin, sulfonylurea and insulin. However, the operation of UHC nationwide just started, and some provinces including the target province in this survey fully introduced the UHC, but this does not apply to all provinces. With this context in mind, the assessment asked about whether the service was free and the amount of money that patients paid for the services. In addition, we also included questions about the budget for NCDs in the target facility.

Medical Chart Review Construction

This medical chart review (Appendix 4) was designed: to obtain data on a specific indicator for the HEARTS guideline, and to confirm whether the practices and delivered services documented in the chart validate the knowledge questions answered by health professionals in the "health service delivery" portion of the questionnaire. The indicator was "six-monthly control of blood pressure among people treated for hypertension" (WHO, 2018c). The HEARTS guideline recommend evaluating this indicator at the health facility level to measure the effectiveness of clinical interventions in controlling blood pressure among cohorts of managed

patient. The medical chart review consisted of six components: basic patient information, disease history, risk estimation for developing CVDs, rationale of diagnosis, treatment/medication, and follow up information.

3-4-3 Pilot testing of the facility assessment tool

Before the pilot testing, the person in charge of NCDs in the MOH reviewed and approved the tool. The field assessment was conducted by a team that included: a representative of the Laos MOH, Champasack provincial hospital, WHO Laos country office, and an Emory University researcher. The MOH director supervised this survey, a WHO staff and Emory researcher mainly conducted the survey, and an officer from the provincial hospital supported the collection of data on medicines and equipment. The assessment was conducted at the following schedule:

July 2-3, 2018 Provincial Hospital (C3)

July 4, 2018 Health Center (C1)

July 5-6, 2018 District Hospital (C2)

For purposes of anonymity, the facilities will be referred to as C1, C2 and C3 instead of their actual names.

The information was provided by multiple interviewees at each target facility. The facility questionnaire was completed by interviewing physicians, nurses, pharmacists, and laboratory technicians. The questionnaire interview and medical chart review was completed by WHO local staff and an Emory researcher.

3-4-4 Findings from the pilot testing

Health Facility Questionnaire

a. Characteristics of facility

Functions of the three health facilities are described in Table 3. In Lao PDR, the provincial hospital covered almost all essential services related to CVD management, ranging from primary secondary health care, and including apart of tertiary services too. The district hospital had sufficient facilities and services to implement the Lao PEN protocol relevant to CVD management. Meanwhile, the health center had no laboratory. However, because Lao PEN allows for measurement of blood sugar and blood cholesterol using a mobile blood glucose meter without a laboratory, the health center has the capacity to manage CVD.

b. Human resources (Health Workforce)

This section collected data on staff employment and in-service trainings. We assessed the quality of care based on staffing ratios using data on the number of health providers and patient volume. For instance, the district hospital was expected to conduct early interventions on patients who are at risk of CVDs and provide treatment using essential medicines to avert complications. Although the district hospital played a core role in the Lao PEN pilot, a few medical staff were in charge of CVD management there. In terms of trainings, a specialized heart hospital in the capital of Lao PDR provided some training related to hypertension, diabetes and CVDs for the staff at provincial hospital once a year or every two years depending on the budget of the heart hospital. However, there were no additional trainings for the district hospital and health center except for the Lao PEN introduction training conducted before the pilot in 2014. This lack of training resulted in technical problems such as the medical staff not being able to use the

glucometers distributed with the launch of Lao PEN, and not being able to apply the WHO/International Society of Hypertension (ISH) chart because it is complicated to use.

c. Medicines/Equipment/Tests (Access to Essential Medicine/Health Service Delivery)

We gathered information on the stock of essential medicines and equipment in this section. All assessed facilities were relatively strong in stocking medicines based on the essential medicines list of Lao MOH issued instead of Lao PEN guideline. The provincial hospital stocked all 9 essential medicines of Lao PEN, whereas the district hospital stocked them all except for beta-blocker, statin tap, sulfonylurea caps and insulin. Health centers were expected to stock only ACE inhibitor based on the list. Each facility was able to manage the medicines on an ongoing basis. Regarding inventory management, the provincial hospital managed their medicine stocks systematically, but both the district hospital and health center faced issues in keeping their stocks because of the problematic supply chain.

The availability of essential technologies for CVD management was also assessed, focusing on treatment capacity, specifically diagnostics. The capacity to run diagnostic testing was associated with the presence of laboratory in the facility, so almost all testing tools were not available in the health center. Equipment such as blood pressure measurement device and glucometer were available at all three facilities, but the district hospital and health center had no electrocardiography. Additionally, the stock management of equipment also faced a similar scenario as the essential medicines.

d. Quality of care (Health Service Delivery)

We tried to ask closed questions about the use of Lao PEN protocols for screening, diagnosis, treatment, and counseling for hypertension and diabetes management to a focal person for NCDs at each facility. However, the medical staff did not use the Lao PEN protocol, so we

asked them about their own practice using open-ended questions (Table 4). Some parts of the PEN interventions were conducted based on knowledge from pre-service education; the focal person at each facility described detailed algorithms on treatments for patients who had already developed the symptoms of the diseases although a variation in descriptions for normal values of blood pressure and blood glucose level was observed. In addition, each staff explained how to implement healthy lifestyle counseling under cultural contexts, but there was no actual health education material for counseling at three facilities. Regarding patient follow-ups, the medical staff arranged the appointment for follow-up with patients at each facility, but they had no system of tracking initial no-shows. In addition, patients bought their required medicine without prescription at a local pharmacy close to their house, so they tended to manage their symptoms by themselves rather than revisiting the hospital.

In particular, the key intervention of Lao PEN was risk estimation for development of CVD, but the medical staff of all facilities did not follow the protocol. Risk estimation was the first step for launching CVD management in the cost-effective interventions for CVD in primary health care settings, so calculating the "10-year risk of a fatal or non-fatal cardiovascular event" (WHO, 2013b) was essential. Even if the Lao PEN guideline was not used, similar intervention for risk prediction and preventive care should be conducted.

The questions in this section had to be revised impromptu during data collection to pivot from knowledge of Lao PEN guidelines to knowledge about CVD management from pre-service education. Regardless, this assessment relied on self-report of medical practices by health providers. The extent to which the reported practices were actually performed could not be evaluated; no direct observations of the health professional were performed and no information was recorded in medical charts about the practice.

e. Service Utilization (Health Service Delivery)

This section on service utilization was designed to be assessed using data from medical information systems; however, all three facilities had poor health information systems. All facilities counted the number of patients from logbooks manually and recorded the total number on a monthly basis. The counting did not follow a standard approach to classify diseases, so the information on utilization included a wide range of disease types. In addition, reporting was not consistent across facilities. For instance, the provincial hospital reported the number of kidney disease patients but the district hospital did not report this. Overall, the data collected in this section was strongly affected by the weaknesses of the medical information system at each facility. The gatekeeper status of each facility was assessed using data obtained in this section and information on facility functions. The health center was expected to mainly conduct risk estimation and healthy lifestyle counseling. However, many patients who seemed to need the health center level of care went to the district hospital rather than the health center. The district hospital also played insufficient role as a gatekeeper, and the province hospital received many patients who should go to the district hospital instead.

f. Referral of patients (Health Service Delivery)

Lao PEN protocols focus on NCDs that can be treated at the primary healthcare level, and they did not cover patients who need beyond primary care. For instance, an emergency situation such as a myocardial infarction is not covered in this protocol; all what is mentioned is that healthcare providers have to refer such patients to a higher-level health facility to provide appropriate care. Thus, we focused our questions on referral practices on the referral infrastructure and management skills of staff.

The medical staff at each facility explained that they referred patients to another facility providing higher level of care if they could not manage the patients' conditions or emergency situation. However, they had no clear referral criteria or a referral letter template. Instead, each patient had a booklet that medical staff used to record a brief description of their conditions and treatments. Patients were expected to bring the booklet when they came to health facilities and it played a role as a referral letter to other facilities.

g. Record keeping/Medical information system (Health Information Systems)

We aimed to assess individual patient's record keeping systems and each facility's reporting system on health information in this section. Regarding individual patient's record, facilities had an individual medical record for inpatients but no records for outpatients to monitor and keep their treatment information. The Lao PEN basically covered outpatient care because many inpatient treatments required a higher level of intervention that Lao PEN did not cover. Thus, it was difficult to monitor individual medical history continuously and assess quality of outpatient care based on Lao PEN protocols. There were two alternative ways to record individual outpatient treatments. First, three facilities used logbooks, which recorded on a daily basis all outpatients' information in order of the day of the patient's visit. The recorded information in the log book was quite limited, so we could not get essential information for CVD management such as height (we gained weight information) and waist circumference, number of visits, and family disease history (Table 5). Second, each patient had their own booklet in which medical staff records information about their condition and provide a brief description of their treatment. Each patient is expected to bring the booklet to every visit, but many of them forget to bring it or have lost it. In summary, the existing logbook system and the individual booklet made it difficult to follow-up with patients and evaluate the quality of care.

In terms of existing facility systems for collecting and reporting data, all facilities had no computerized administrative system, so they manually counted numbers of cases of a certain disease from the facility logbook. Lao PDR installed the District Health Information System 2 (DHIS2), and each facility should report the required information of DHIS2. We collected impromptu information about DHIS2 although there were no questions relevant to DHIS2 in our created questionnaire. The DHIS2 also had a limitation for accessing information because a part of CVDs and complications such as strokes and kidney disease were not built in the system (Table 6). Moreover, the DHIS2 was not regularly updated about current utilization. In sum, all existing health information systems were insufficient to assess the type of disease and patient numbers managed at the facility.

h. Financing and administration (Health Systems Financing)

We focused on financial protection and facility budget for NCDs in this section. National health insurance has expanded countrywide in 2018 after pilot operations, and it covered costs for diagnostic examinations, drugs, medical equipment, documents, treatment costs, normal room charge for the target patients covered by Lao PEN in Champasack province. Actually, the target facilities adopted the UHC scheme, and patients who were confirmed to be official residents of Champasack province using the “family book” which was a residential certificate in each province benefited from this plan. Hence, we assessed whether the patient received financial support under UHC to cover CVD treatment.

In terms of facility-level budgets, there were no specified budget for CVD-related efforts such as in-service training and developing health education materials. Further training for medical staff and full allocation of the essential medicines recommended by Lao PEN were necessary in expanding the PEN project. Moreover, some equipment such as test strips for

glucometers and educational material for healthy lifestyle counseling needed to be supplied and maintained to provide high quality care at each facility. Hence, the lack of budgets for CVD management poses a serious problem because without funding for these types of activities and equipment the program cannot be sustainable.

Medical Chart Review

This review tool was not fully functional at all three facilities because there were no individual medical records for outpatients.

3-4-5 Limitations for the tool

Limitations of the tool ranged from minor to major. Minor issues in both the health facility questionnaire and the medical chart review tool included wording of some questions and the answer options for a few questions. Major limitations uncovered by the pilot testing are described below. Moreover, recommendations of the revision of the tool were made, and prerequisites required for using this tool at the health facility level were identified to improve the limitations.

Facility Questionnaire

The questions on quality of care in the health service delivery building block were not fully answered due to difficulty or hesitancy by the respondents in providing answers. These questions asked about specific standard clinical values (e.g. blood glucose level) and medications prescribed on a routine basis. The questions were hard to answer because these parameters depend on the patient condition. For instance, Lao PEN guidelines indicate a specific protocol of how to control hypertension using medication and healthy lifestyle counseling. The facility questionnaire, on the other hand, asked the health professional about the most appropriate antihypertensive medicine for a patient who is just diagnosed (Appendix 3-D. Question 4-2).

When we asked this question, the responders hesitated to answer because the choice of medicine would be different depending on the patient condition (e.g. age and having other diseases). Another issue with the tool was that even if the question was answered, we could not conclude that the medicine was indeed prescribed to the patient. In other words, while the question was intended to assess the application of guidelines and best practices, its focus on knowledge precluded an assessment of real-life clinical practices.

In addition, collecting data about service utilization via the health facility questionnaire was problematic because of the weaknesses in health information systems at both the facility and the national levels. Each facility was responsible for reporting the number of patients to the provincial health office, but the required information was insufficient to assess the utilization of CVD patients. For instance, facilities were requested to report all heart disease diagnoses, whether chronic or acute conditions, under one umbrella. Another problem was encountered with referral data whereby information could not be collected on referrals to lower-level from higher-level facilities like provincial hospitals. Patients are sometimes referred to a district hospital or health center after completing their intense treatment at a provincial hospital. This type of data was not captured by our tool because questions focused only on the referral system from a lower- to higher-level facility.

Medical Chart Review

WHO recommends calculating some indicators for evaluation such as ‘six-monthly monitoring and control of blood pressure among people treated for hypertension’. This indicator requires the date of registration of the hypertension patient and the date of their last visit after 6 months of monitoring their hypertension. We intended to collect data on these types of indicators via the medical chart review; however, the status of medical records in facilities precluded this

assessment. The three facilities mainly use a daily logbook to record all outpatients' information in aggregate fashion, and no individual-level patient data was available. Moreover, while it is very important to assess long-term follow-ups for CVD management, it was difficult to obtain information about the number of visits for each patient at the facility because they did not keep separate outpatient records.

3-5 Discussion

Overall, this assessment tool provided a basic framework for evaluating the capacity of health facilities for managing CVDs. Specifically, the health facility questionnaire helped in understanding whether each facility fulfilled the minimum standards for health service delivery of CVD. The tool was effective in assessing the health workforce and medical products required for CVD treatment at the level of health facilities; it helped identify insufficient staffing and supply-chain problems for medical products. In terms of health service delivery, the assessment tool identified a big gap between knowledge level of health professionals on the ground and the Lao PEN protocol. As for the medical chart review, limited individual medical record system imposed a challenge in implementing data collection using this form. The findings from pilot testing the health facility questionnaire and medical chart review tool developed in our study identified strengths and limitations of the instrument. The assessment demonstrated strength in collecting data on the essential medicines and equipment component. The questions about medicines and equipment as indicated in PEN and HEARTS guideline were easy to assess. On the other hand, questions related to the health service delivery part, using both the health facility questionnaire and the medical chart review tool, had some limitations. First, respondents had difficulty answering the knowledge-based questions (e.g. those about standard clinical values such as blood glucose level as well as which medications should be prescribed for certain

common conditions). These questions were not easily answerable due to their dependence on specific patient conditions. Besides, those questions resembled taking a medical exam and respondents may have not felt comfortable answering them in an interviewer-administered setting due to fear of providing incorrect answers. In addition, even when those questions were answered, we still could not assess whether the related practice has indeed been performed in the clinic. We expected the medical chart review to provide us evidence about the practice part. For instance, when asking health professionals about providing lifestyle counseling, we expected that a record of providing this service would be documented in the medical chart; however, this was not the case. We found out that individual medical record systems for outpatients did not exist in all surveyed facilities; as such, we could not confirm whether the medical practice validates reported knowledge of clinical practices and guidelines. Instead of patient-specific medical records, facilities used logbooks in which information on all outpatients was recorded in aggregate form and was limited in nature. Examples of data collected in the logbook included patient's name, age, residential area, basic vital signs, diagnosis, brief description of their treatment, prescription, weight, and insurance status. No data was collected on family history, number of visits, detailed laboratory data, or counseling interventions, all of which were essential information for CVD management. Piloting the tools also allowed us to test the feasibility of the survey methodology. It revealed that the time and cost invested in the data collection were substantial because the survey staff went to survey sites and it took almost two days for completing the survey in each facility.

In summary, three main gaps were identified in the tools of the assessment and its implementation: difficulty in assessing the actual delivery of health services via the health facility questionnaire, inability to conduct medical chart reviews to supplement data on

practitioner knowledge of best practices and guidelines or to assess service utilization, and limitations in the time and cost efficiency of data collection. To offset these limitations, three possible solutions were considered.

For the first issue of the facility questionnaire, questions related to quality of care are in the revision process. Questions about health service delivery, which focused on knowledge and were difficult to answer by respondents, were reviewed and re-organized to be more reflective of the Knowledge, Attitude and Practices (KAP) survey model. In general, the KAP survey attempt to reveal characteristic traits in knowledge, attitude and practice (behaviors) commonly shared by a population or target group about specific issues (Gumucio et al., 2011). A linear relationship between knowledge, attitudes, and practices is assumed in this model. The lack of knowledge assessed as a function of awareness is assumed to influence motivation for providing health care services. Such a scenario is expected to be mediated by attitudes centered on a lack of specific expectations, which in turn would lead to poor practices/actions. Re-designing survey questions around the KAP model has the advantage of assessing actual CVD management practices by health care providers. In addition, a KAP survey model might identify notable gaps between what is said and what is done, thus informing what interventions are needed, if any, to improve practices of health service providers (Muleme, Kankya, Ssempebwa, Mazeri, & Muwonge, 2017). In addition, it may be advantageous to replace the medical chart review with a guided direct observation of providers' behaviors and practices to supplement KAP questions. With the goal of limiting data collection costs in mind, the direct observation can be conducted for selected sample of health facilities. Table 7 shows a sample of the revised questions.

For the second issue of weak medical records and health information systems, development of individual medical recording system and national health information system will

be required to follow up CVD patients, assess utilization of health services, and evaluate the impact of interventions on disease burden. This issue needs a systematic solution by the government and cannot be directly fixed by our data collection tools. We could attempt to create and distribute, as part of our assessment tools, simplified individual medical records and health facility reports to collect information on the utilization of services; however, this would be temporary solution. Therefore, we recommend that a fundamental system-level solution be implemented in Lao PDR to solve this problem effectively and in a sustainable manner. Regarding individual recording systems, their initial stages of use involved manual paper-based storage methods. However, because paper records were insufficient for managing large amount of patient information, storing it, and sharing it among other practitioners, electronic health records (EHRs) have been increasingly utilized, particularly in high-income countries (Okuzu, 2016). Although the EHRs have potential benefits, implementation in resource-constrained countries is obstructed by human, economic, and infrastructural factors. Introducing EHRs would be challenging in LMICs, but some countries have been able to overcome the barriers. For instance, Nigeria introduced CliniPAK 360 which was 3G point-of-serve data capture tool for responding to the high maternal mortality rate (Reach, 2018). This mobile application does not only include patient records but also has several functions, such as analyzing the data and supporting diagnosis by providing algorithms to identify risk factors. It also covers key functions for CVD management, such as tracking patients and following them up. This program was supported by several stakeholders initially, then the state government took over the responsibility of operating the program and fully self-funding its statewide scale up in 2017. This successful Nigeria example demonstrated the feasibility of operating EHRs in LMICs. WHO also published a guideline introducing EHR systems in LMICs, and it indicated that disease classification

systems such as International Classification of Disease (ICD)-10 should be installed to operate EHR systems appropriately (Pacific, 2006). In Lao PDR, the MOH is currently engaged in introducing ICD-10, so the time is ripe for the country to consider establishing EHRs too. Regarding the national health information system, Lao PDR introduced DHIS2 in 2014, which is a software platform to manage health information systems (M. Evaluation, 2017); however, this system was not fully operational. In the facility questionnaire, we attempted to gather information on utilization in each facility, but the monthly reported data on utilization from each facility was very limited. Disease reporting by each health facility should be linked to DHIS2 because it is the national reporting system. However, the reported information was different depending on each facility. For example, one facility reported information on kidney disease and others did not. Additionally, DHIS2 itself had a major limitation when it comes to collecting CVD-related data. The current DHIS2 version classifies CVDs and related diseases as "hypertension", "other circulatory conditions and the heart issue", and "diabetes" only. A more specific classification system for diseases and complication based on ICD-10 should be used to accurately assess disease burden and measure indicators recommended by the HEARTS guideline. In summary, data from patients who have CVD and complications would need to be collected at each health facility level in a format aligned to DHIS2 that fully integrates ICD-10. EHRs should also be introduced in Lao PDR and other LMICs that face similar situations.

The third issue of time and cost involved in data collection, whereby investigators had to visit each facility and collect all information via in-person, can be offset by a more efficient strategic plan for data collection. The WHO's Service Availability and Readiness Assessment (SARA) provide us a practical example to conduct this CVDs assessment efficiently. SARA is a health facility assessment tool for assessing and monitoring the service availability and readiness

of the health sector. It is recommended by WHO and USAID to measure and track progress in health system strengthening (DHS, n.d.). This tool consists of a questionnaire and a toolkit for survey planning and data collection which includes sampling strategy, data analysis, and budgeting. Data collection in SARA uses key informant interviews with the most knowledgeable person in the health facility and observations of key items such as medication stock. Regarding observation, the survey tool of SARA is quite general for purposes of this assessment. However, there are good examples for observation questions in the Service Provision Assessment (SPA) by USAID (Sheffel, Karp, & Creanga, 2018) and HEARTS guideline. The sampling strategy of SARA provides several options for domains of estimation and sample selection. SARA recommends a survey duration where each visit takes one day in each facility and the entire process generally takes from three to six months (WHO, 2013c). For the CVD facility assessment, we would adopt key informant interviews and observations from target facilities selected by simple random sampling. One of the sampling strategies adopted by SARA that this assessment can use in the future is a nationally representative sample obtained by taking a simple random sample of facilities within each stratum (facility type and managing authority). Health care providers will be one category of key informants to interview to obtain data on KAP questions for service delivery. At the end of the interview, we recommend checking questionnaires and resolving missing/unreliable information before leaving the facility. In addition to key informant interviews, we would observe actual practices of health care providers using a newly developed observation tool, which would replace the medical chart review. We also need to train multiple data collectors to implement the survey at several health facilities simultaneously to save overall data collection time. Alternatively, another data collection strategy can be used for time saving, whereby the data collector asks a focal person of the target

facility to complete a self-administered questionnaire before visiting the facility to complete the survey and conduct direct observations.

This study has several limitations. First, the pilot testing was conducted only in three facilities at three different service levels in one province. The results from these pilots may not be fully representative of the entire country. Second, the proposed data collection strategy would delay survey implementation because it will take time to identify focal points at target facilities and data collectors, engage them, and train them in conducting this survey. Third, these tools were developed in English, and Laotians mainly speak Laotian language. Because the main data collectors and respondents in this assessment would be Laotian staff, a translation of the assessment tools will be needed to ensure that no health facility is left behind. Finally, the survey attempted to identify health service delivery of CVDs, and this is different than assessing quality of care. WHO suggests that quality of care consists of both provision of care and experience of care (WHO, 2016c). In the future, we could adopt this framework for CVD care and expand our current tool to assess patient experience. Despite these limitations, the assessment tool had the advantage of identifying strengths and weaknesses of health facilities involved in CVD management, data that is very important for improving existing CVD care programs and for informing the design of new programs in Lao PDR and other LMICs.

Chapter 4 Conclusion and Recommendations

4-1 Conclusion

In many LMICs, including Lao PDR, national priorities have been focused on health problems such as infectious diseases and maternal and child health, and only recently has NCD management started to gain attention, owing to the growing burden of NCDs. The WHO has taken a leadership role in supporting LMICs with addressing their NCD burden by issuing several guidelines for NCD prevention and control. LMICs have been attempting to adapt these guidelines, but many are facing challenges. NCD management requires practices and infrastructure that differ from the treatment and prevention of communicable diseases. These include risk assessment, screening for the asymptomatic diseases, health promotion including behavioral modification for unhealthy lifestyle, and long-term care for patients who develop these diseases. However, health systems in LMICs are often weak and lack the capability for these multi-level interventions. The assessment tool we created would provide information on the current status of CVD management capacity at health facility levels in target countries. The tool will help to develop country-specific sustainable CVD management plans. In the future, as CVD interventions get strengthened, further assessment of patient satisfaction with care will be essential to evaluate and improve quality of care.

4-2 Recommendations

As a result of pilot testing the health facility assessment tool, two sets of recommendation were developed, one that applies to the assessment itself – tool and process for data collection – and another that applies to the health facilities and the broader health system in Lao PDR.

4-2-1 Recommendations for the assessment

- Using the KAP survey model to develop integrated questions on health service delivery *(Recommended revisions are shown in Table 7)*
- Conducting direct observation in place of medical chart reviews to assess actual clinical practices *(Recommended sample direct observation form for a patient with high blood pressure is shown in Table 8)*.
- Adapting the SARA methodology for data collection and sampling

4-2-2 Recommendations for Lao PDR

- Establishing EHR systems nationwide
- Strengthening DHIS2 based on ICD-10 and its linkage with reporting systems of health facilities

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Figure 1. Conceptual Framework

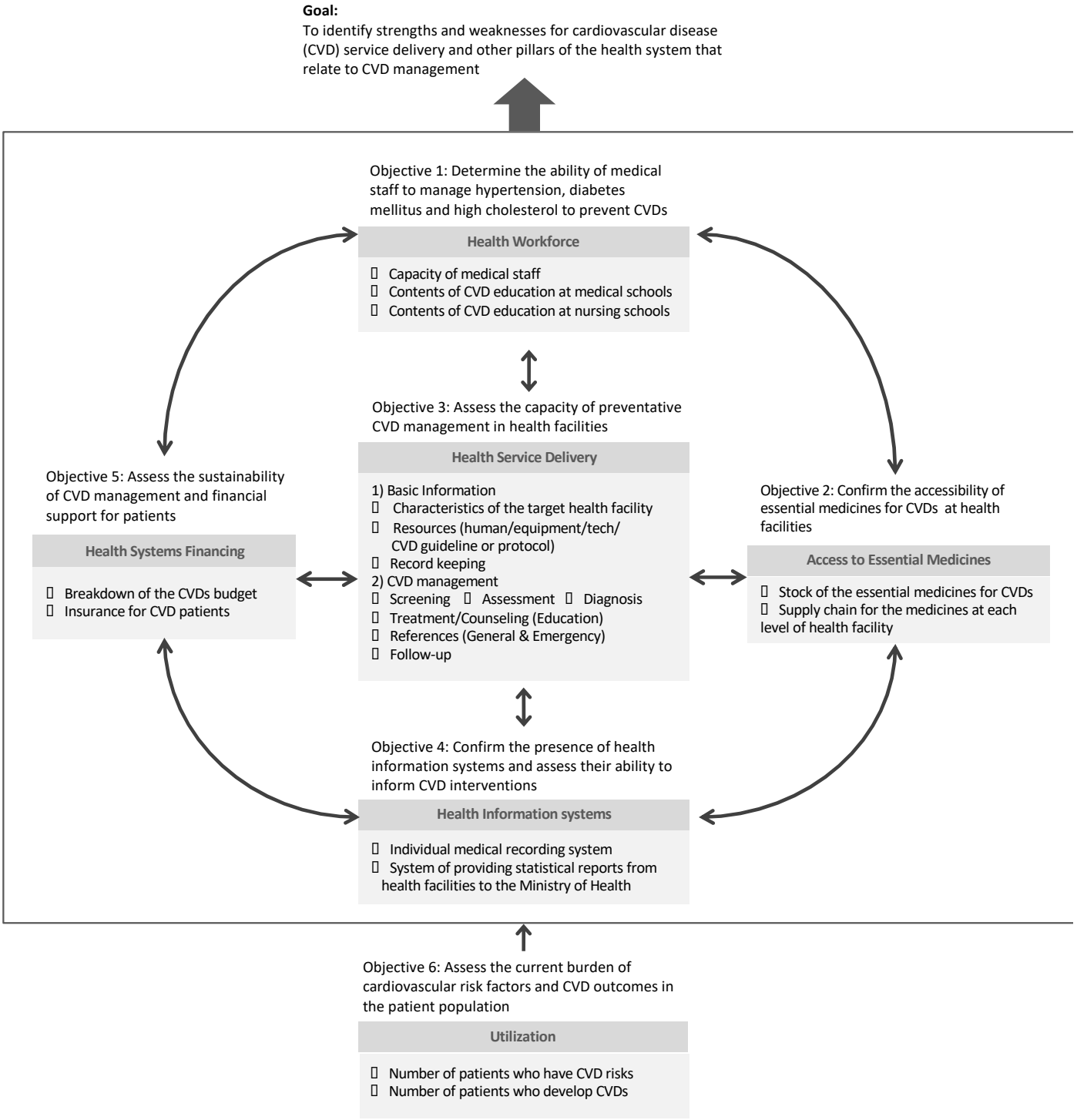

Table 1. Contribution of WHO Package of Essential Noncommunicable Disease interventions for primary (PEN) to Health System Building Blocks

Leadership/governance	■ Assess needs and gaps and facilitate the use of available resources for prevention and control of NCDs efficiently and equitably. ■ Support government efforts to drive the agenda towards universal coverage.
Financing	■ Prioritize NCD interventions to support raising of adequate funds for universal coverage. ■ Facilitate phased- out provision of financial protection for NCDs.
Medical products and technologies	■ Define prerequisites for integrating a core set of essential NCD interventions into primary care. ■ Develop an affordable list of essential medicines and appropriate technologies. ■ Improve access to essential medicines.
Health information system	■ Provide templates to gather reliable health information of people.
Health workforce	■ Provide training material to enhance knowledge and skills for NCDs prevention and control. ■ Audit performance.
Service delivery	■ Improve access to essential preventive and curative NCD interventions. ■ Provide equitable opportunities for early detection. ■ Define core set of cost-effective NCD interventions. ■ Provide tools for their implementation. ■ Improve quality of care. ■ Improve gate-keeper function of primary care. ■ Reduce costs due to hospital admissions and complications.
People	■ Develop tools for community engagement and empowerment of people for self care. ■ Improve health outcomes.

Source: WHO PEN (WHO, 2010c)

Table 2. Recommended cost-effective interventions and Package of Essential Noncommunicable Disease interventions for primary (PEN) & HEARTS technical package (HEARTS) protocols

Category of Interventions	Interventions	Indicators based on PEN & HEARTS
'Best buys': effective interventions with cost effectiveness analysis (CEA) ≤ I$100 per Disability-Adjusted Life Year (DALY) averted in low- and middle-income countries (LMICs)	Drug therapy (including glycaemic control for diabetes mellitus (DM) and control of hypertension using a total risk* approach) and counselling to individuals who have had a heart attack or stroke and to persons with high risk (≥ 30%) of a fatal and non-fatal cardiovascular event in the next 10 years Drug therapy (including glycaemic control for DM and control of hypertension using a total risk approach) and counselling to individuals who have had a heart attack or stroke and to persons with moderate to high risk (≥ 20%) of a fatal and non-fatal cardiovascular event in the next 10 years	■ Screening ■ Assessment ■ Risk estimation using WHO/International Society of Hypertension risk charts ***Risk < 20%*** ■ Counsel on diet, physical activity, smoking cessation and avoiding harmful use of alcohol(1) ■ Referral(2) ***Risk 20 to < 30%*** ■ Persistent blood pressure (BP) ≥ 140/90 mmHg consider antihypertensive medications & (1)(2) ***Risk > 30%*** ■ Persistent BP ≥ 130/80 mmHg consider antihypertensive medications ■ Give a statin & (1)(2) ***Diabetes*** ■ Give an antihypertensive for those with BP ≥ 130/80 mmHg ■ Give a statin to all with type 2 DM aged ≥ 40 years ■ Titrate metformin or sulfonylurea ■ Give foot care and assess feet at risk of ulcers ■ Hypertension tratment using specific medications ■ Follow up every 3 months
Category of Interventions	**Interventions**	
Effective interventions with CEA >I$100 per DALY averted in LMICs	Treatment of new cases of acute myocardial infarction with either: acetylsalicylic acid, or acetylsalicylic acid and clopidogrel, or thrombolysis, or primary percutaneous coronary interventions (PCI)	
	Treatment new cases of acute myocardial infarction with aspirin, initially treated in a hospital setting with follow up carried out through primary health care facilities at a 95% coverage rate	
	Treatment of new cases of acute myocardial infarction with aspirin and thrombolysis, initially treated in a hospital setting with follow up carried out through primary health care facilities at a 95% coverage rate	
	Treatment of new cases of myocardial infarction with primary PCI, aspirin and clopidogrel, initially treated in a hospital setting with follow up carried out through primary health care facilities at a 95% coverage rate	
	Treatment of acute ischemic stroke with intravenous thrombolytic therapy	
	Primary prevention of rheumatic fever and rheumatic heart diseases by increasing appropriate treatment of streptococcal pharyngitis at the primary care level	
	Secondary prevention of rheumatic fever and rheumatic heart disease by developing a register of patients who receive regular prophylactic penicillin	
Other recommended interventions from WHO guidance (CEA not available)	Treatment of congestive cardiac failure with angiotensinconverting-enzyme inhibitor, beta-blocker and diuretic	
	Cardiac rehabilitation post myocardial infarction	
	Anticoagulation for medium-and high-risk non-valvular atrial fibrillation and for mitral stenosis with atrial fibrillation	
	Low-dose acetylsalicylic acid for ischemic stroke	
	Care of acute stroke and rehabilitation in stroke units	
Source	Tackling NCDs (WHO, 2017c)	WHO PEN (WHO, 2013b), HEARTS (WHO, 2018a)

* Total risk is defined as the probability of an individual experiencing a cardiovascular disease event (for example, myocardial infarction or stroke) over a given period of time, for example 10 years

Table 3. Basic information on three health facilities

	C1 Health Center	C2 District Hospital	C3 Provincial Hospital
BASIC INFORMATION			
Total number of beds	5 beds	15 beds	250 beds
Focal person who is in charge of NCD management	1 assisstant doctor*	2 doctors	1 doctors
FACILITY			
Pharmacy	○	○	○
Laboratory	×	○	○
Emergency Room	×	×	○
Operation Room	×	×	○
Intensive Care Unit	×	×	○
Coronary Care Unit	×	×	○
SERVICE			
Hospitalization	○	○	○
Ambulance	×	○	○
Laser treatment for Retinopathy	×	×	○
Operation for limb amputation	×	×	○
Dialysis	×	×	○
Rehabilitation	×	×	△1
Palliative Care	×	×	△2

*assisstant doctor: the staff who took trainings for diagnosis and prescribing medicines

○: present ×: absent

△1: There is no rehabilitator, but a rehabilitator comes to do the rehabilitation for patient from another HP.

△2: One nurse took a short-course trainning of palliative care in Thailand.

Table 4. Verbal explanation of hypertension (HT) and diabetes (DM) treatment protocol by the focal person in three health facilities

Key interventions of *PEN/**HEARTS		C1 Health Center	C2 District Hospital	C3 Provincial Hospital
1. Screening				
HT&DM	Assessing cardiovascular risk using WHO/International Society of Hypertension (ISH) risk prediction charts for the targets	"We do not assess cardiovascular risk using WHO/ISH charts for patients at all, because the chart is complicated to undestand and wrtitten by English."	"We sometimes assess cardiovascular risk using WHO/ISH charts for patients who have symptoms, but not always."	"We have no time to conduct risk estimation such as WHO/ISH risk prediction because we have to treat lots of patients who have already HT or DM."
2. Diagnosis				
HT	Conducting two-times measurement of blood pressure (BP) on two visits, and diagnose HT when both BP are Systolic BP (SBP)≥140 and/or Diastolic BP (DBP)≥90 mmHg	"We measure BP twice at intervals on same day, and diagnose HT when both BP are SBP≥140 and/or DBP≥90 mmHg."	"We measure BP twice at intervals on same day, and diagnose HT when both BP are SBP≥140 and/or DBP≥90 mmHg."	"We comprehensively diagnose HT for patients having symptoms whose BP are around SBP≥140 and/or DBP≥90 mmHg with information on other risk factors like their lifestyles."
DM	Conducting fasting plasma glucose (FPG) test for adults who have symptoms of DM or 40+ years old with Body Mass Index >25, then diagnose DM when FPG≥126mg/dl	"We conduct FPG test for adults who have symptoms of DM, then diagnose DM when FPG≥120mg/dl."	"We conduct FPG test for adults who have symptoms of DM, then diagnose DM when FPG≥130mg/dl."	"We comprehensively diagnose DM for patients having symptoms whose FPG are above 120 mg/dl with information on HbA1c and other risk factors like their family history."
3. Treatment & Follow-up				
HT	Prescribe initial antihypertensive medication except Beta blocker for a patients with HT	"We prescribe only anapril when we have the stock of it."	"We prescribe anapril first. If it is out of stock, we ask patients to buy it at a pharmacy outside of our hospital."	"We prescribe anapril or furosemide first."
	Prescribe aspirin if patients had prior CVD	(There is no aspirin)	(There is no aspirin)	"We prescribe aspirin for patients who had chronic heart diseases."
	Prescribe statin if patients>40 yrs with diabetes or if patients had prior CVD	(There is no statin)	(There is no statin)	"We prescribe statin for patients who have coronary problem and experience of stroke."
DM	Prescribe oral hypoglycemic agent for patients with DM	"We cannot treat DM patient under a regulation, so we just say the patient to go to the district hospital."	"We prescribe only daonil (Sulphonylurea)."	"We prescribe metaformin first."
	Arrange or conduct the exams for each complication of DM	(No capacity)	"We tell patients to go to the provincial hospital with patient monitoring book if they have symptoms for complications of DM."	"We arrange exams or referral to eye doctor based on patients'conditions and symptoms."
HT&DM	Conduct healthy lifestyle counsellings	"We conduct health education about eating habits, tobacco and smoke reduction, stress management and physical activity."	"We conduct health education about eating habits, tobacco and smoke reduction, and physical activity."	"Doctor or nurse conduct health education about risk factors in their lifestyle."
	Arrange next visiting with patients to follow their HT (every 1 month) or DM (every 3 months)	"We arrange the follow-up day in 7-10 days depending on their prescription."	"We prescribe 10-tablet medications for HT or DM patients every visit, so we arrange the follow-up day in 7-10 days."	"We arrange next visiting with patients to follow their HT (every 1 month) or DM (every 3 months)."

*PEN: Package of Essential Noncommunicable Disease interventions for primary healthcare in low-resource settings

**HEARTS: HEARTS technical package

Table 5. Availability of outpatient's information from the logbook

Required Data	C1 Health Center	C2 District Hospital	C3 Provincial Hospital
Basic Information			
Name/Sex/Age	○	○	○
Residential place	○	○	○
Basic vital signs	○	○	○
Diagnosis	○	○	○
Prescription	○	○	○
Height	×	×	×
Weight	○	○	○
Information for Screening			
Histrory of smoking	×	×	×
Waist circumference	×	×	×
Family history	×	×	×
Information for Risk Estimation			
Blood glucose	×	○	△
Total blood cholesterol	×	○	△
BMI	×	×	×
Other Specific Information on CVD Management			
Counselling on risk factors	×	×	×
Number of visits	×	×	×
Follow-up dates	×	×	×

○: available ×: not available

△: The information is written in the patient monitoring book.

Table 6. Availability of number of patients from District Health Information System 2 (DHIS2)

	Hypertension	Diabetes	Cardiovascular diseases (CVDs)	Heart Attacks	Strokes	Kidney Disease
DHIS2	○	○	△	△	×	×

○: available ×: not available

△: CVD and Heart Attacks are included in 'Other circulatory and heart' of DHIS2 together.

Table 7. Sample integrated questions of health service delivery with Knowledge, Attitude and Practices (KAP) survey model in the health facility questionnaire

KAP model		Sample Question	Response Options	
Screening	**K**nowledge of screening for patients who might have CVD risk factors.	In which individuals do you think information on cardiovascular risk factors sould be collected? (Tick all that apply)	□ age > 40 years □ smokers □ outpatient who has hypertension	□ outpatient who has diabetes □ outpatient who has first-degree relatives with history of kidney disease
	Awareness of respondent's possible practices for risk estimation for CVDs	What patient information would you collect for risk assessment of CVD? (Tick all that apply)	□ age □ gender □ smoking status	□ systolic blood pressure □ blood glucose □ body mass index
	Practice of respondent to an outpatient who has CVD risk factors	What did you do first when you found patient who had CVD risk factors last time?	□ (Describe:)	
Diagnosis	**K**nowledge of symptoms for hypertension at an early stage	Is early stage of hypertension symptomatic or asymptomatic?	□ Symptomatic □ Asymptomatic □ Do Not Know	
	Awareness of respondent's possible practices for diagnosis of hypertension	If you suspect an outpatient might have hypertension, what would you do next? (Tick all that apply)	□ measure blood pressure twice □ conduct blood test □ conduct urine test	□ ask family history for hypertension □ ask dietary habits □ ask level of physical activity
	Practice of diagnosing hypertension	How did you diagnose hypertension for an outpatient when you most recently met? Please describe all process for diagnosis.	□ (Describe:)	
Treatment	**K**nowledge of medications for treatment of hypertension	What medications do you think you should prescribe for an outpatient who is diagnosed with hypertension?	□ CCB (name:) □ ACE inhibitor (name:) □ ARB (name:)	□ Diuretic (name:) □ Other (specify:)
	Awareness of respondent's possible practices for patients with hypertension	If you think an outpatient might have hypertension and first visit to the clinic, what would you do for him/her in the day? (Tick all that apply)	□ measure blood pressure twice □ prescribe medicines (name:) □ conduct healthy lifestyle counseling	□ decide next following date □ request him/her admission □ refer him/her to other health facility
	Practice of initial treatment for an outpatient who newly develop hypertension	What did you do for an outpatient whose systolic blood pressure was over 140 mmHg that you most recently met?	□ (Describe:)	
Healthy Lifestyle Counselling	**K**nowledge of health education materials for patients with hypertension at the facility	Are there health education materials for patients with hypertension in your facility?	□ Yes (specified contents:)	□ No □ Do Not Know
	Awareness of respondent for responsibility conducting healthy lifestyle counselling	Which staff do you think is appropriate to provide healthy lifestyle counselling for an outpatient? (Tick all that apply)	□ physician □ nurse □ dietitian	□ pharmacist □ laboratory technician □ nursing student
	Practice of counseling on self-management of hypertension for an outpatient	What information did you provide in a healthy lifestyle counselling for outpatient with hypertension last time?	□ Did Not Provide □ Provided (Describe:)	

Table 8. Sample questions for direct observation for a patient with high blood pressure

1. Screening
☐ Collect information on: □ age ( ) □ gender (M/F) □ smoking status (Yes/No) □ already diagnosed hypertension (Yes/No) □ already diagnosed diabetes (Yes/No) □ history of premature CVD in first degree relatives (Yes/No) □ history of diabetes or kidney disease in first degree relatives (Yes/No)
☐ Measure waist circumference (cm)
☐ Use WHO/ISH risk prediction charts (Risk %)
2. Diagnosis
☐ Measure blood pressure (/ mmHg), (/ mmHg)
☐ Measure blood glucose ( )
☐ Measure blood choresterol ( )
☐ Calculate body mass index ( ) / Height (cm), Weight (kg)
3. Treatment
☐ Prescribe antihypertensive medications (name:)
☐ Prescribe statin
☐ Prescribe aspirin
☐ Prescribe oral hypoglycemic agent
☐ Conduct healthy lifestyle counselling: Yes → 4.Healthy Lifestyle Counselling, No →5. Admissions and Referrals
4. Healthy Lifestyle Counselling
☐ Stop all tobacco use, avoid secondhand tobacco smoke.
☐ Drink no more than two units of alcohol per day and do not drink on at least two days of the week.
☐ Increase physical activity to equivalent of brisk walk 150 minutes per week.
☐ If overweight, lose weight.
☐ Eat heart-healthy diet: □ Eat a low-salt diet. □ Eat ≥5 servings of vegetables/fruit per day. □ Use healthy oils (e.g. olive, sa ower). □ Eat nuts, legumes, whole grains and foods rich in potassium. □ Limit red meat to once or twice a week at most. □ Eat fish or other food rich in omega 3 fatty acids (e.g., flax seeds) at least twice a week. □ Avoid added sugar from cakes, cookies, sweets, fizzy drinks and juice.
5. Admissions and Referrals
☐ Recommend the patient's admission today □ The patient accepted admission. □ The patient did not accept admission.
☐ Refer the patient to another health facility (name of the facility:)
☐ Fix next follow-up date with the patient (date: /)

Appendix 1. Package of Essential Noncommunicable Disease interventions for primary (PEN)

Sample Questionnaire

Sample questionnaire

(Adaptation may be needed according to country context)

Assessment of capacity to prevent and manage major noncommunicable diseases (NCDs) in primary care centres in low-resource settings

To be completed by managers of primary care facilities.

Thank you for taking time to respond to this questionnaire.

Country: _____ **Date:** _____

Name of person completing the questionnaire: _____

Title: _____

Facility name: _____

Full mailing address of the facility: _____

Classification of facility:

☐ publicly ☐ private ☐ nongovernmental organization (NGO)

Setting type:

☐ rural ☐ urban ☐ semi-urban

Note: This questionnaire will not provide the information about patients' perspective of primary care services, such as time that doctors spend with patients at each visit, patient's perception of quality of services, etc.

Human resources

1. **Availability of human resources for managing major noncommunicable diseases (NCDs):**

	Number present today	Number expected to be present today, including absentees
a) Specialist doctor		
b) General/family doctor/physician		
c) Nurse		
d) Community health worker/health educator		
e) Other (specify .....)		
f) Other (specify .....)		

2. **Are doctors, nurses and/or other health workers trained on noncommunicable disease (NCD) management?**

	Doctors	Nurses	Other health worker
Yes, regularly trained	☐	☐	☐
Yes, trained one-time	☐	☐	☐
No, not trained on NCD management	☐	☐	☐

Equipment

3. **Availability of basic equipment for managing major noncommunicable diseases (NCDs):**

Equipment	Number of functional devices available	Number of devices out of service/awaiting repair
a) Blood pressure measuring devices (BPMD)	total:	total:
Please give the breakdown	Mercury BPMDs: Aneroid BPMDs: Automatic BPMDs:	Mercury BPMDs: Aneroid BPMDs: Automatic BPMDs:
b) Oxygen cylinders (full)		
c) Weighing machines		
d) ECG machines		
e) Measuring tape		

Equipment	Number of functional devices available	Number of devices out of service/awaiting repair
f) Nebulizers		
g) Peak flow meters		
h) Stethoscope		
i) Thermometer		
j) Health education material		
k) Pulse oximeter		
l) Spacers		
m) Glucometer		

4. How often are blood pressure measuring devices (BPMDs) calibrated and checked for accuracy?

☐ Once ayear or more ☐ Less than once a year ☐ Never ☐ Don't know

5. How is equipment usually repaired and maintained?

☐ Repaired at the facility
☐ Sent back to manufacturer for repair
☐ Sent back to "government store" for repair
☐ Other, specify .....

6. What, if any, are the difficulties in getting repairs to equipment done?

.....

.....

.....

.....

Infrastructure/services

7. Are the following procedures being conducted at the facility when needed?

a) Administration of oxygen (via mask or tube)	☐ Yes	☐ No, why not? .....
b) Administration of intravenous (IV) fluids/drip	☐ Yes	☐ No, why not? .....
c) IV injection	☐ Yes	☐ No, why not? .....
d) Intramuscular (IM) injection	☐ Yes	☐ No, why not? .....
e) Subcutaneous injection	☐ Yes	☐ No, why not? .....

f) Electrocardiography (ECG)	☐ Yes	☐ No, why not? .....
g) Cardiopulmonary resuscitation	☐ Yes	☐ No, why not? .....
h) Manual ventilation with a bag valve mask resuscitator (ambu-bag)	☐ Yes	☐ No, why not? .....
i) Visual acuity examination	☐ Yes	☐ No, why not? .....
j) Examination for neuropathy with knee hammer/tuning fork, etc.	☐ Yes	☐ No, why not? .....
k) Peak flow test	☐ Yes	☐ No, why not? .....
l) Opthalmoscopy	☐ Yes	☐ No, why not? .....

8. Can the following investigations be carried out?
(Check "Yes" only if the investigation can be done on the day of the survey)

Urine albumin/protein testing	☐ Yes, at this facility	☐ Yes, at referral, but not at this facility	☐ No
Urine glucose/sugar	☐ Yes, at this facility	☐ Yes, at referral, but not at this facility	☐ No
Urine ketone bodies	☐ Yes, at this facility	☐ Yes, at referral, but not at this facility	☐ No
Blood sugar	☐ Yes, at this facility	☐ Yes, at referral, but not at this facility	☐ No
Troponin	☐ Yes, at this facility	☐ Yes, at referral, but not at this facility	☐ No
Blood cholesterol	☐ Yes, at this facility	☐ Yes, at referral, but not at this facility	☐ No
Serum creatinine	☐ Yes, at this facility	☐ Yes, at referral, but not at this facility	☐ No

9. Do you have a bed where you can stabilize a very ill patient before transfer to a referral institution?

☐ Yes ☐ No

10a. If injections are provided at the facility, what type of needle is used?

☐ Disposable needles

☐ Reusable, sterilized needles. How are needles sterilized? .....

☐ Injections not provided at the facility

☐ Don't know

10b. Is there a safe disposal for used needles available?

☐ Yes, safe disposal available

☐ No, no safe disposal available

11. Are the following services available at the facility?

a) Patient counselling and education on smoking, diet, alcohol and/or physical activity	☐ Yes	☐ No	☐ Don't know
b) Counselling and education of family members on smoking, diet, alcohol and/or physical activity	☐ Yes	☐ No	☐ Don't know
c) Patient counselling for diabetes self-management	☐ Yes	☐ No	☐ Don't know
d) Patient education for self-administration of insulin	☐ Yes	☐ No	☐ Don't know

Medicines

12a. Are medicines purchased directly by the facility for distribution to patients?

☐ Yes ☐ No

12b. If "Yes", are medicine purchases subsidized by the government?

☐ Yes ☐ No

13. Availability of medicines in the facility (tick only one box for each medicine):

Generic medicines	Always available	Sometimes available	Not available at all
1) Adrenaline (injection)	☐	☐	☐
2) Aspirin	☐	☐	☐
3) Atenolol	☐	☐	☐
4) Beclometasone inhaler	☐	☐	☐
5) Benzathine benzylpenicillin (injection)	☐	☐	☐
6) Enalapril	☐	☐	☐
7) Erythromycin	☐	☐	☐
8) Furosemide	☐	☐	☐
9) Glibenclamide	☐	☐	☐
10) Hydrochlorothiazide	☐	☐	☐
11) Hydrocortisone (injection)	☐	☐	☐
12) Insulin (long acting)	☐	☐	☐
13) Insulin (soluble)	☐	☐	☐
14) Ipratropium bromide	☐	☐	☐
15) Isosorbide dinitrate	☐	☐	☐
16) Statins (lovastatin or simvastatin)	☐	☐	☐

Generic medicines	Always available	Sometimes available	Not available at all
17) Metformin	☐	☐	☐
18) Calcium channel blockers (nifedipine retard, amlodipine)	☐	☐	☐
19) Sodium chloride infusion	☐	☐	☐
20) Phenoxymethyl penicillin	☐	☐	☐
21) Prednisolone	☐	☐	☐
22) Salbutamol inhaler	☐	☐	☐
23) Salbutamol tablets	☐	☐	☐
24) Salbutamol injectable	☐	☐	☐
25) Paracetamol	☐	☐	☐
26) Ibuprofen	☐	☐	☐
27) Codeine	☐	☐	☐
28) Oral morphine	☐	☐	☐
29) Morphine injection	☐	☐	☐
30) Glyceryl trinitrate	☐	☐	☐
31) Heparin	☐	☐	☐
32) Amoxycillin	☐	☐	☐
33) Clotrimoxazole	☐	☐	☐
34) Promethazine injection	☐	☐	☐
35) Glucose injectable solution	☐	☐	☐

Utilization of services

14. What is the total number of visits to the health facility for outpatient services last month?

Total number of visits last month: .....

This figure is based on: ☐ Register/record ☐ Estimation

15. What is the total number of visits to the health facility for outpatient services yesterday?

Total number of visits yesterday: .....

This figure is based on: ☐ Register/record ☐ Estimation

16. How many of the patient visits made yesterday were for:

a) Number of visits made for heart disease, high blood pressure, stroke, heart failure:	.....
b) Number of visits made for diabetes:	.....
c) Number of visits made for asthma or chronic cough:	.....
d) Number of visits by cancer patients:	.....

Referral of patients

17. Can you refer patients to another facility in the event of a chronic disease emergency?

☐ Yes ☐ No

If you answered "Yes", go to Question 18. If you answered "No", skip to Question 24.

18. How many kilometers (kms) from your facility is the nearest referral institution for a medical emergency?

☐☐ Hours ☐☐ Minutes ☐☐☐ Kilometers

19. Have you ever wanted to refer a patient with acute, severe symptoms or emergency related to heart disease, diabetes or asthma but were unable to do so?

☐ Yes, Why? ..... ☐ No

20. Does your facility have an ambulance?

☐ Yes ☐ No

21. If the facility does not have an ambulance, can patient transfer by ambulance be arranged?

☐ Yes ☐ No ☐ Don't know

22. What means of transport is most frequently used to transfer emergency patients at your facility (check only one)?

☐ Ambulance ☐ Public transport
☐ Commercial vehicle (e.g. taxi) ☐ Private vehicle
☐ Other (specify: .....)

23. Approximately how long does it take to transfer a patient to the nearest referral medical institution?

☐☐ Hours ☐☐ Minutes or ☐☐ Days

24a. Can you refer patients with noncommunicable diseases (NCDs) for a second opinion/specialist consultation?

☐ Yes ☐ No, Why not? .....

24b. If "yes", the patients will usually be:

☐ Referred back to you for follow-up ☐ Followed up at the upper level (referral) facility

24c. Can you refer patients with noncommunicable diseases (NCDs) to the nearest referral medical institution for some additional test?

☐ Yes ☐ No, Why not? .....

Record keeping/medical information system

Patient records

25. How do patients access the facility?

☐ Walk-in only ☐ By appointment only

☐ *Combination of appointments and walk-ins*

26. Does the facility keep a record of patient visits?

☐ Yes, records kept for all visits

☐ Yes, records kept for certain types of visit (specify: .....)

☐ *No records kept*

If you answered "Yes", go to Question 27. If you answered "No", skip to Question 29.

27. How are records kept?

☐ Patient files ☐ Registry system

☐ Other (specify: .....)

28. Are patient files retrieved and consulted each time they visit the facility?

☐ Yes, patient files usually/always consulted ☐ Yes, patient files consulted, but only when necessary

☐ *No, patient files not consulted*

Facility records

29. Does the facility have stock card or log books for:

a) Medicine

☐ Yes, but not used routinely ☐ Yes, used routinely and currently up to date ☐ *No*

b) Consumables (e.g. syringes, bandages)

☐ Yes, but not used routinely ☐ Yes, used routinely and currently up to date ☐ *No*

Financing and administration

30a. Do patients pay the facility for medicines?

☐ Yes, full payment
☐ Yes, partial payment –> Proportion paid by patient: .....%
☐ *No, medicines are provided for free*

30b. If medicines are provided for free or for partial payment, who subsidizes it?

☐ Central government ☐ Local government ☐ Private insurance
☐ Social assistance plans ☐ Other (specify: .....) ☐ Don't know

31a. Do patients pay the facility for consultations?

☐ Yes, full payment
☐ Yes, partial payment –> Proportion paid by patient: .....%
☐ *No, consultations are provided for free*

31b. If consultations are provided for free or for partial payment, who subsidizes it?

☐ Central government ☐ Local government ☐ Private insurance
☐ Social assistance plans ☐ Other (specify: .....) ☐ Don't know

32a. Do patients pay the facility for diagnostic tests?

☐ Yes, full payment
☐ Yes, partial payment –> Proportion paid by patient: .....%
☐ *No, diagnostic tests are provided for free*

32b. If diagnostic tests are provided for free or for partial payment, who subsidizes it?

☐ Central government ☐ Local government ☐ Private insurance
☐ Social assistance plans ☐ Other (specify: .....) ☐ Don't know

Community links

33. Are there any community activities to support noncommunicable disease (NCD) services provided at primary health care (PHC) facilities?

☐ Yes ☐ No ☐ Don't know

If "yes", specify: (e.g. vehicle for patient transfer is provided for free by the community, patient support groups)

.....

.....

.....

Appendix 2. HEARTS technical package (HEARTS) Baseline Facility Assessment

Annex 3: Baseline facility assessment template

Facility information

Country: Date:

Name of person completing the questionnaire:

Job title:

Facility name:

Setting type: Rural ☐ Urban ☐

1 Human resources

1.1 Availability of human resources for managing major noncommunicable diseases (NCDs):

	Number present today	Number full-time	Number part-time
Specialist doctor			
Generalist/family doctor/physician			
Nurse			
Community health worker/health educator			
Pharmacist			
Laboratory technician			
Registration/data clerk			
Other (specify)			

1.2 Are doctors, nurses and/or other health workers trained in CVD management?

	Doctors	Nurses	Other health workers
Yes, regularly trained			
Yes, one-off training			
No, not trained in CVD management			

2 Equipment

2.1 Availability of basic equipment for managing CVD

Equipment	Number of functional devices available	Number of devices out of service/awaiting repair
a) Blood pressure measuring devices (BPMD)	Total:	Total:
Breakdown	Mercury BPMDs: Aneroid BPMDs: Automatic BPMDs:	Mercury BPMDs: Aneroid BPMDs: Automatic BPMDs:
b) Measuring tape/height board/stadiometer		
c) Weighing machines		
d) ECG machines		
e) Glucometer		
f) Stethoscope		

2.2 How often are blood pressure measuring devices calibrated and checked for accuracy?

Once a year or more ☐ Less than once a year ☐ Never ☐ Don't know ☐

2.3 How is equipment usually repaired and maintained?

Repaired at the facility ☐ Sent back to manufacturer for repair ☐

Sent back to "government store" for repair ☐

Other (specify)

2.4 What, if any, are the difficulties in repairing equipment?

3 Infrastructure/services

3.1 Can the following investigations be carried out?

(Tick "Yes" only if the investigation can be done on the day of the survey)

Investigation	Yes, at this facility	Yes, at referral, but not at this facility	No
Urine dipstick testing – protein/ glucose/sugar			
Blood sugar			
Urine ketone bodies			
Urine microalbuminuria			
HbA1c			
Serum cholesterol			
Serum creatinine			

3.2 Do you use national guidelines for the diagnosis and management of CVD and diabetes in this facility?

Type of guideline	Yes, seen	Yes, not seen	No
Cardiovascular disease			
Diabetes			

3.3 Are the following services available at this facility?

	Yes	No	Don't know	Who provides (doctor, nurse, counsellor, etc.)
a) Patient counselling and education on smoking, diet, alcohol consumption, physical activity				
b) Counselling and education of family members on smoking, diet, alcohol consumption, physical activity				
c) Cardiovascular risk assessment				
d) Patient counselling for self-management of diabetes				
e) Patient education for self-administration of insulin				

3.4 Are health education materials available at this facility for:

	Yes	No	Don't know
a) Smoking			
b) Diet			
c) Alcohol consumption			
d) Physical activity			
e) Hypertension			
f) Diabetes			

4 Medicines

4.1 Are medicines purchased directly by the facility for distribution to patients?

Yes ☐ No ☐

4.2 If "yes", is the purchase of medicines subsidized by the government?

Yes ☐ No ☐

4.3 Availability of medicines in the facility (tick only one box for each medicine):

Medication	Always available	Sometimes available	Never available	Stock-out in last 3 months
Aspirin				
ACE inhibitor (enalapril) or ARB				
Beta blocker (atenolol)				
Calcium channel blocker				
Thiazide				
Statin (lovastatin or simvastatin)				
Metformin				
Sulphonylurea (glibenclamide / gliclazide / glipizide)				
Insulin (injection)				
Statins				

5 Service utilization

5.1 Number of visits, patients, consultations

Utilization	Number	Based on register	Based on estimation
Total number of visits to the health facility for outpatient services last month			
Total number of visits to the health facility for outpatient services yesterday			
Average number of consultations per day			
Number of patients registered for hypertension			
Number of patients registered for diabetes			

6 Patient referral

6.1 Can you refer patients to another facility in the event of a CVD emergency?

Yes ☐ No ☐

If you answered "Yes", go to Question 6.2. If "No", go to Question 6.8.

6.2 How far from your facility is the nearest referral institution for a medical emergency (in minutes, hours, kilometres)?

Minutes ☐ Hours ☐ Kilometres ☐

6.3 Have you ever wanted to refer a patient with acute, severe symptoms or emergency related to heart disease, diabetes or asthma, but were unable to do so?

Yes ☐ No ☐

If yes, why?

6.4 Does your facility have an ambulance?

Yes ☐ No ☐

6.5 If the facility does not have an ambulance, can patient transfer by ambulance be arranged?

Yes ☐ No ☐ Don't know ☐

6.6 What means of transport is most frequently used to transfer emergency patients at your facility? (check only one)

Ambulance ☐ Public transport ☐ Commercial vehicle (e.g. taxi) ☐

Private vehicle ☐ Other (specify):

6.7 (a) Can you refer patients with CVD for a second opinion/specialist consultation?

Yes ☐ No ☐

If no, why not?

6.7 (b) If yes, the patients will usually be:

Referred back to you for follow-up ☐

Followed up at the upper-level (referral) facility ☐

6.7 (c) Can you refer patients with CVD to the nearest referral medical institution for additional tests?

Yes ☐ No ☐

If no, why not?

6.8 Approximately how long does it take to transfer a patient to the nearest referral medical institution?

Minutes ☐ Hours ☐ Days ☐

7 Record keeping/medical information system

General

7.1 Does the facility have the following?

Description	Yes, functional	Yes, awaiting repair	No
Computer			
Telephone			
Internet connection			

Patient records

7.2 How do patients access the facility?

Walk-in only ☐ By appointment only ☐

Combination of appointments and walk-ins ☐

7.3 Does the facility keep a record of patient visits?

Yes, records kept for all visits ☐

Yes, records kept for certain types of visit (specify):

No records kept ☐

If you answered "Yes", go to Question 7.4. If "No", skip to Question 7.5.

7.4 How are records kept?

a) Patient files ☐ Registry system ☐

Other (specify):

b) Paper records ☐ Electronic health records ☐

7.5 Are patient files retrieved and consulted each time they visit the facility?

Yes, patient files usually/always consulted ☐

Yes, patient files consulted, but only when necessary ☐

No, patient files not consulted ☐

Facility records

7.6 Does the facility have a stock card or log books for:

a) Medicine

Yes, but not used routinely ☐ Yes, used routinely and currently up to date ☐

No ☐

b) Consumables (e.g. syringes, bandages)

Yes, but not used routinely ☐ Yes, used routinely and currently up to date ☐

No ☐

8 Financing and administration

8.1 Do patients pay the facility for medicines?

Yes, full payment ☐

Yes, partial payment ☐ Proportion paid by patient: ___%

No, medicines are provided free ☐

8.2 If medicines are provided free or for partial payment, who subsidizes it (check all that apply)?

Central government ☐	Local government ☐	Private insurance ☐
Social assistance plans ☐	Other (specify):	Don't know ☐

8.3 Do patients pay the facility for consultations?

Yes, full payment ☐

Yes, partial payment ☐ Proportion paid by patient: ___%

No, consultations are provided free ☐

8.4 If consultations are provided free or for partial payment, who subsidizes it (check all that apply)?

Central government ☐	Local government ☐	Private insurance ☐
Social assistance plans ☐	Other (specify):	Don't know ☐

8.5 Do patients pay the facility for diagnostic tests?

Yes, full payment ☐

Yes, partial payment ☐ Proportion paid by patient: ___%

No, diagnostic tests are provided free ☐

8.6 If diagnostic tests are provided free or for partial payment, who subsidizes it (check all that apply)?

Central government ☐	Local government ☐	Private insurance ☐
Social assistance plans ☐	Other (specify):	Don't know ☐

9 Community links

9.1 Are there any community activities to support NCD services provided at primary health care facilities?

Yes ☐ No ☐ Don't know ☐

If "yes", specify: (e.g. vehicle for patient transfer is provided free by the community, patient support groups):

Appendix 3. Health Facility Questionnaire

DH/HC_FACILITY ASSESSMENT TOOL #1 [Ask focal staff]

FACILITY:	DISTRICT:
Data collector name:	Date of assessment:

Interviewee's Name and position:	Contact Number:

A. Characteristics of facility			
1	Classification of facility	Tick one box:	☐Healthcare Center ☐District Hospital (A or B)
2	Functions	Tick all that apply:	☐Hospitalization ☐Ambulance ☐Laboratory ☐Pharmacy ☐Emergency Room ☐Operation Room ☐Intensive Care Unit
3	Total number of beds	[ ] beds	
4	Is there a focal person who is in charge of NCD management?	Tick one box:	☐Yes ☐No ☐Don't know

B. HUMAN RESOURCES				
1. Availability of human resources for managing Cardiovascular disease (CVD) and Diabetes Mellitus (DM)				
	Staff	Number of Employment	Number expected to be present today, including absentees	NOTE
1	Generalist/Family doctor			→ 5-2. Nurse [number] Type of Education -2.5 year course: [ ] -3 year course: [ ] -bachelor(4 year): [ ]
2	Specialist Doctor of CVD			
3	Specialist Doctor of DM			
4	Ophthalmologist			
5	Nurse			
6	Nursing student			→ 6-2. Nursing students
7	Primary health care worker			Role: [ ]
8	Pharmacist			
9	Laboratory technician			→ 7-2. Primary health care worker
10	Registration/data clerk			Role: [ ]
11	Other [Specify:]			

2. Additional Question			
1	Does the physicain or doctor come to this facility every weekday?	Tick one box:	☐Yes ☐No [when does he/she come?:]

3. Noncommunicable diseases (NCDs) Training on CVD and DM at the facility				
1	Are there staff who took Lao-PEN training?	☐ Yes [who?:]		☐ No
Tick one box and enter the number if applicable		Yes, regularly trained	Yes, trained one-time	No, not trained
2	Are doctors trained on CVD and DM management?	☐ [how often:]	☐ [when:]	☐
3	Are nurses trained on CVD and DM management?	☐ [how often:]	☐ [when:]	☐
4	Are other health workers trained on CVD and DM management?	☐ [how often:]	☐ [when:]	☐

DH/HC_FACILITY ASSESSMENT TOOL #2 [Ask focal staff and check with eyes]

FACILITY:	DISTRICT:
Data collector name:	Date of assessment:

C. MEDICINES/EQUIPMENT/TESTS

1. Availability of core CVD and diabetes medicines

	Medicine	name of medicine (mg) × total number of stock today	At least one nonexpired item available today		Stock-out* in previous 3 months		
1	Aspirin cap/tab	(mg) ×	Yes	No	Yes	No	not recorded
2	ACE inhibitor cap/tab	(mg) ×	Yes	No	Yes	No	not recorded
3	Beta blocker cap/tab	(mg) ×	Yes	No	Yes	No	not recorded
4	Calcium channel blocker cap/tab	(mg) ×	Yes	No	Yes	No	not recorded
5	Statin cap/tab	(mg) ×	Yes	No	Yes	No	not recorded
6	Thiazide diuretic cap/tab	(mg) ×	Yes	No	Yes	No	not recorded
7	Metformin cap/tab	(mg) ×	Yes	No	Yes	No	not recorded
8	Sulphonylurea cap/tab	(mg) ×	Yes	No	Yes	No	not recorded
9	Insulin regular injection	(mg) ×	Yes	No	Yes	No	not recorded
10	If there is an insulin, is it kept in a refrigerator? (check with eyes)		Yes		No		
11	If 'Yes' for stock-out in previous 3 months, the reason why: [ ]						

** Stock-out = zero items available for dispensing on at least one service day*

2. Availability of essential CVD technologies

	Equipment	Number of items available and [functional today]	Number of items required by this facility for CVD management*
1	Adult weighing scale	/ [ ]	*Enter each number after assessment based on, for example, number of consulting rooms and patient loads
2	Measurement tape	/ [ ]	
3	Height board	/ [ ]	
4	Stethoscope	/ [ ]	
5	Blood pressure measurement device ☐Mercury ☐Aneroid ☐Automatic	/ [ ]	
6	Glucometer	/ [ ]	
7	Electrocardiography (ECG)	/ [ ]	

	Tests	Equipment and reagents available and functional to conduct testing today		
1	Blood glucose test strips	Yes	No	[why?: from when?:]
2	Urine protein dipstick testing	Yes	No	[why?: from when?:]
3	Urine ketones dipstick testing	Yes	No	[why?: from when?:]
4	Laboratory blood glucose testing	Yes	No	[why?: from when?:]
5	Cholesterol testing	Yes	No	[why?: from when?:]
6	Creatinine testing	Yes	No	[why?: from when?:]
7	HbA1C testing	Yes	No	[why?: from when?:]
8	75g oral glucose load (OGTT)	Yes	No	[why?: from when?:]
9	Urine microalbuminuria testing	Yes	No	[why?: from when?:]

3. How does the facility keep the results of laboratory exam?	[ ]

DH/HC_FACILITY ASSESSMENT TOOL #3 [Ask focal staff and check with eyes / Take photos of materials]

FACILITY:	DISTRICT:
Data collector name:	Date of assessment:

D. QUALITY OF CARE			
1. Resources: Do you use any guidelines or materials for the diagnosis and treatment of CVD and DM in this facility?			
1	CVD management guidelines or protocol	Tick one box:	☐Yes, seen (■Take photos) ☐Yes, not seen ☐No
2	DM management guidelines or protocol	Tick one box:	☐Yes, seen (■Take photos) ☐Yes, not seen ☐No
3	Risk-based CVD management guidelines(PEN)	Tick one box:	☐Yes, seen ☐Yes, not seen ☐No [why?]
4	CVD healthy lifestyle counselling tools	Tick one box:	☐Yes, seen (■Take photos) ☐Yes, not seen ☐No
2. Screening:			
1	Do you collect the information on CVD/DM risk factors from all adults to identify target patients at outpatient service?	Tick one box:	☐Yes → Q2 ☐No → Skip to section on "Diagnosis"
2	If 'Yes', what information do you collect?	Enter the answer and/or tick one box:	[ ] If he/she can't answer, please recommend to see the protocol if they have it. ☐checked it ☐Don't Know
3. Diagnosis:			
1	Do you estimate cardiovascular risk using any guidelines?	Tick one box:	☐Yes → Q2 ☐No → Q3
2	If 'Yes', which guideline do you use?	Tick one box:	☐WHO/ISH risk prediction charts ☐Other [Specify: ■take a photo]
3	What blood pressure level should you diagnosed as Hypertension (HT)?	Enter the number and/or tick one box:	■SBP ≥ [ ] and/or DBP ≥ [ ] mmHg If he/she can't answer, please recommend to see the protocol if they have it. ☐he/she saw it ☐Don't know
4	Do you have any problems to diagnose HT using the standard at this facility?	Tick one box:	☐Yes [what problem?:] ☐No ☐Not applicable
5	Which test do you use to diagnose DM?	Tick one box:	☐Fasting random plasma glucose (FPG) ☐HbA1c ☐Random plasma glucose (RPG) ☐75g OGTT
6	What blood sugar level should you diagnosed as DM?	Enter the number and/or tick one box:	■FPG/RPG/75g OGTT: [ ] mg/dl mmol/l If he/she can't answer, please recommend to see the protocol if they have it. ☐he/she saw it ☐Don't know
7	Do you have any problems to diagnose DM using the standard at this facility?	Tick one box:	☐Yes [what problem?:] ☐No ☐Not applicable
4. Treatment:			
1	In what condition should you initiate prescribe antihypertensive medicines to patients?	Enter the answer and/or tick one box:	[ ] If he/she can't answer, please recommend to see the protocol if they have it. ☐he/she saw it ☐Don't know
2	Which medicine do you use as an initial antihypertensive medication?	Tick one box:	☐CCB ☐ACE inhibitor ☐ARB ☐diuretic ☐Other [Specify:]
3	Do you have any problems to prescribe the initial antihypertensive medicine to the patients using the standard at this facility?	Tick one box:	☐Yes [what problem?:] ☐No ☐Not applicable
4	In what condition should you prescribe aspirins to patients?	Enter the answer and/or tick one box:	[ ] If he/she can't answer, please recommend to see the protocol if they have it. ☐he/she saw it ☐Don't know

DH/HC_FACILITY ASSESSMENT TOOL #4 [Ask focal staff]

FACILITY:	DISTRICT:
Data collector name:	Date of assessment:

D. QUALITY OF CARE			
4. Treatment: (Continued)			
5	Do you have any problems to prescribe the aspirins to the patients using the standard at this facility?	Tick one box:	☐Yes [what problem?:] ☐No ☐Not applicable
6	In what condition should you prescribe statins to patients?	Enter the answer and/or tick one box:	[ ] If he/she can't answer, please recommend to see the protocol if they have it. ☐he/she saw it ☐Don't know
7	Do you have any problems to prescribe the statins to the patients using the standard at this facility?	Tick one box:	☐Yes [what problem?:] ☐No ☐Not applicable
8	What is goal for blood pressure?	Tick one box:	☐Bp < [/] mmHg ☐No rule ☐Other [Specify:] If he/she can't answer, please recommend to see the protocol if they have it. ☐he/she saw it ☐Don't know
9	Do you arrange next visiting with patients to follow-up their Hypertension (HT)?	Tick one box:	☐Yes [interval:] ☐No ☐Not applicable
10	In what condition should you initiate prescribe DM control medicines to patients?	Enter the answer and/or tick one box:	[ ] If he/she can't answer, please recommend to see the protocol if they have it. ☐he/she saw it ☐Don't know
11	Which medicine do they use as an initial DM control medication?	Tick one box:	☐Gliclazide ☐Metformin ☐Insulin ☐Other [Specify:]
12	Do you have any problems to prescribe an initial DM control medicine using the standard in practice at this facility?	Tick one box:	☐Yes [what problem?:] ☐No ☐Not applicable
13	Do you arrange dilated-pupil retina exam after diagnosis of DM?	Tick one box:	☐Yes ☐No [why:]
14	Do you assess risk of lower limb amputation after diagnosis of DM?	Tick one box:	☐Yes ☐No ■ Is there capacity to exam? ☐Yes ☐No
15	Do you arrange the tests of proteinuria and serum creatinine for CKD screening after diagnosis of DM?	Tick one box:	☐Yes ☐No ■ Is there capacity to exam? ☐Yes ☐No
16	Do you examin feet for ulcer of patients who diagnosed of DM?	Tick one box:	☐Yes ☐No ■ Is there capacity to exam? ☐Yes ☐No
17	What is goal for glycaemic control?	Tick one box:	☐FPG/RPG/75g OGTT ≤ [ ] mmol/l (mg/dl) ☐No rule ☐Other [Specify:] If he/she can't answer, please recommend to see the protocol if they have it. ☐he/she saw it ☐Don't know
18	Do you arrange next visiting with patients to follow-up their DM?	Tick one box:	☐Yes [interval:] ☐No ☐Not applicable
5. Counselling/Health Education:			
1	Does the facility offer counsellings about NCDs for target patients?	Tick one box:	☐Yes → Q2 ☐No → skip to the next section on "Service Utilization"

DH/HC_FACILITY ASSESSMENT TOOL #5 [Ask focal staff]

FACILITY:	DISTRICT:
Data collector name:	Date of assessment:

D. QUALITY OF CARE			
5. Counselling/Health Education (Continued):			
2	Which medical staff conduct Lifestyle counseling?	Tick all that apply:	☐Physicians ☐Nurses ☐Dietitian ☐Other [Specify:]
3	Where does the staff conduct the counselling?	Tick all that apply:	☐Outpatient clinic ☐Bed side ☐Counselling room ☐Other [Specify:]
4	Is there a system for tracking initial defaulters?	Tick one box:	☐Yes ☐No [why:] ☐Don't Know
5	Can patients receive counselling for self-management of diabetes?	Tick one box:	☐Yes ☐No [why:] ☐Don't Know
6	Can patients receive education for self-administration of insulin?	Tick one box:	☐Yes ☐No [why:] ☐Don't Know

E. SERVICE UTILIZATION			
1. Is there disease registry system in your facility?			☐ Yes ☐ No
2. What is the :			
Enter the number and tick one box		Number	This figure is based on
1	total number of visits to the health facility for outpatient services last month?		☐Register/Record or ☐Estimation
2	total number of visits to the health facility for outpatient services yesterday?		☐Register/Record or ☐Estimation
3	number of registered patients for hypertension?		☐Register/Record or ☐Estimation
a-3	[ ] ?		☐Register/Record or ☐Estimation
4	number of registered patients for diabetes?		☐Register/Record or ☐Estimation
a-4	[ ] ?		☐Register/Record or ☐Estimation
3. How many of the patient visits made last month were for:			
Enter the number and tick one box		Number	This figure is based on
1	Number of visits made for heart disease, or high blood pressure, or stroke, or heart failure:		☐Register/Record or ☐Estimation
2	Number of visits made for diabetes:		☐Register/Record or ☐Estimation

F. REFERRAL OF PATIENTS			
1	Can your refer patients to another facility in the event of a CVD emergency?	Tick one box:	☐Yes [where?:]→ Q2 ☐No [why?:] ☐Don't Know → Q3
2	Have you ever wanted to refer a patient with acute, severe symptoms or emergency related to heart disease, diabetes or asthma, but were unable to do so?	Tick one box:	☐Yes [why?:] ☐No
3	What means of transport is most frequently used to transfer emergency patients at your facility?	Tick one box:	☐Ambulance ☐Public transport ☐Commercial vehicle (e.g. taxi) ☐Private vehicle ☐Other[Specify:]
4	Can you refer patients with CVD to the nearest referral medical institution for additional tests?	Tick one box:	☐Yes ☐No [why?:]

DH/HC_FACILITY ASSESSMENT TOOL #6 [Ask focal staff and check & take photos of medical records]

FACILITY:	DISTRICT:
Data collector name:	Date of assessment:

G. RECORD KEEPING / MEDICAL INFORMATION SYSTEM			
1	Does the facility have computer?	Tick one box: [number]	☐Yes, functional [ ] ☐Yes, awaiting repair [ ] ☐No
2	Q1 is 'Yes', is it easy to access for you?	Tick one box:	☐Yes ☐No [why:]
3	Does the facility have internet connection?	Tick one box: [number]	☐Yes, functional [ ] ☐Yes, awaiting repair [ ] ☐No
4	What types of medical records on NCDs does the facility have?	Tick all that apply & ■Take photos	☐medical Interview Sheet ☐NCD Risk Assessment Form ☐HT Registry ☐ DM Registry ☐Epi-Info ☐Other [Specify:]
5	Does the facilty keep a record of patient visits?	Tick one box:	☐Yes, records kept for all visits → Q6 ☐Yes, records kept for certain types of visit [Specify:]→ Q6 ☐No → Q7
6	Q5 is 'Yes', how are records kept?	Tick one box:	☐Patient files ☐Registry system ☐Other [Specify:]
7	Does the facility have a stock card or log books for medicine?	Tick one box:	☐Yes, used routinely and currently up to date ☐Yes, but not used routinely ☐No
8	Does the facility have a stock card or log books for consumables(e.g. syringes)?	Tick one box:	☐Yes, used routinely and currently up to date ☐Yes, but not used routinely ☐No
9	Does the facility have medical record that can trace each individual?	Tick one box:	☐Yes, used routinely and currently up to date ☐Yes, but not used routinely ☐No
10	Do districts report regularly?	Tick one box:	☐Yes, used routinely and currently up to date ☐Yes, but not used routinely ☐No

H. FINANCING AND ADMINISTRATION			
1	Do patients pay the facility for medicines/consultations/diagnostic tests? Tick one box:		
	a. medicines	b. consultations	c. diagnostic tests
	☐Yes, full payment ☐Yes, partial payment Propotion paid by patient: [ ]% ☐No, medicines are provided free	☐Yes, full payment ☐Yes, partial payment Propotion paid by patient: [ ]% ☐No, consultations are provided free	☐Yes, full payment ☐Yes, partial payment Propotion paid by patient: [ ]% ☐No, tests are provided free
2	If medicines/consultations/diagnostic tests are provided free or for partial payment, who subsidizes it? Tick all that apply:		
	a. medicines	b. consultations	c. diagnostic tests
	☐Central government ☐Local government ☐Private insurance ☐Social assistance plans ☐Other [Specify:] ☐Don't Know	☐Central government ☐Local government ☐Private insurance ☐Social assistance plans ☐Other [Specify:] ☐Don't Know	☐Central government ☐Local government ☐Private insurance ☐Social assistance plans ☐Other [Specify:] ☐Don't Know
3	Do you have budget specifically for NCDs?	Tick one box:	☐Yes → Answer question 4 ☐No ☐Don't Know → Finish this questionnaire form
4	If yes, Please specify what the budget is for?	Tick one box:	☐Buy commodities ☐Training ☐Monitoring ☐Others [ ]

Appendix 4. Medical Chart Review Tool

Cardiovascular disease and diabetes: Medical Chart Review

1. Data collector name:			2. Date of data collection:			3. Form number:		
4. Facility name:			5. File number:			6. Year of birth:		
7. Gender:	☐M ☐F		9. CVD/DM visit in last 12 months:			☐Yes [How many times?:] ☐No ☐ Not recorded		
8. Diagnosis:								
10. The reason of the first visiting to this facility:						[Date:] or ☐ referral from another health facility [Name:]		
A. CVD/DM history								
1. Prior CVD			☐Yes		☐No		☐Not recorded	
2. Chronic kidney disease (CKD)			☐Yes		☐No		☐Not recorded	
3. Hypertension			☐Yes		☐No		☐Not recorded	
4. Diabetes			☐Yes		☐No		☐Not recorded	
5. Heart attack or stroke since registration			☐Yes		☐No		☐Not recorded	
6. Amputation since registration			☐Yes		☐No		☐Not recorded	
B. Data for diagnosis [Date:]								
1.Smoking:	☐Yes ☐No ☐Not recorded	2.Height:	[ ] cm or ☐Not recorded	3.Weight:	[ ] kg or ☐Not recorded	4.BMI:	[ ] or ☐Not recorded	
5.Blood Pressure:	Reading1: [/] mmHg		Reading2: [/] mmHg or ☐Not recorded					
6.Blood Sugar: ☐FPG or ☐RPG	[ ] ☐mg/dl or ☐mmol/l or ☐Not recorded		7.Total Cholesterol:		[ ] mmol/l or ☐Not recorded			
C. Risk level estimation (if no prior CVD or CKD)								
1. Was risk level estimation conducted?	☐Yes [Date:] ☐No							
2. CVD risk % :	[ ] %		(Investigator calculates the risk after this chart review: [ ] %)					
D. CVD/DM treatment								
1. CVD Healthy Lifestyle Counselling conducted			☐Yes [Date:]				☐No	
2. Statin prescribed			☐Yes [Starting date:]				☐No	
3. Aspirin prescribed			☐Yes [Starting date:]				☐No	
4. Antihypertensive prescribed			☐Yes [Starting date:]				☐No	
5. Oral hypoglycemic agent/insulin prescribed			☐Yes [Starting date:]				☐No	
E. CVD/DM follow up								
Blood pressure:	1. Recorded at last CVD visit		☐Yes [Date:]				☐No	
	2. Reading at last CVD visit:		Reading 1: [ ] mmHg or ☐ Not recorded			Reading 2: [ ] mmHg or ☐ Not recorded		
Diabetes patient:	3. FPG/RPG recorded at last diabetes visit		☐Yes [Date:]				☐No	
	4. FPG/RPG result at last diabetes visit		[ ] ☐mg/dl or ☐mmol/l					
	5. HbA1c recorded in last 12 months		☐Yes [Date:]				☐No	
	6. Last HbA1c (in last 12 months)		[ ] ☐mg/dl or ☐mmol/l					
7. Was the patient hospitalized after this outpatient visit?					☐Yes		☐No	