Skill Development for Prevention and Control of Type 2 Diabetes and Cardiovascular Disease by Primary Healthcare Teams in South Asia

STAKEHOLDER REPORT

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CONTENTS

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1. ABBREVIATIONS

AHP	Allied Health Professionals
CDC	Centres for Disease Control
CHW	Community Health Worker
COPD	Chronic Obstructive Pulmonary Diseases
CVD	Cardiovascular disease
GHRU	Global Health Research Unit
LMIC	Lower- and Middle-Income Countries
MO	Medical Officer
NCD	Non-Communicable Disease
PEN	Package of essential non-communicable disease interventions

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2. EXECUTIVE SUMMARY

Mortality and disability due to NCDs are rising in South Asian countries and other LMICs rapidly. A strong PHC system is essential for delivering universal health coverage, effective prevention and control of NCDs and ensuring equal access for all population strata. Countries such as Bangladesh have adapted the WHO PEN and HEARTS in PHCs for NCD management. The approach consists of task sharing between members of the PHC team and incorporates CHWs into care delivery for chronic disease management. A number of NCD training manuals have been developed in countries such as India and Sri Lanka at national and local levels for the PHC workforce and are stratified by skill level i.e. CHWs, AHPs and MOs'. Although the content in these manuals covers a vast amount of NCD knowledge, the effective delivery of the content to the PHC workforce and the application of this knowledge in terms of the PHC teams providing appropriate NCD care to the community remains a significant challenge.

It is possible that the PHC workforce faces difficulties with understanding the training content which may further result in poor retention and absorption of the knowledge and skills by the PHC teams. It is therefore advisable to revise the existing training manuals, by incorporating additional skills and knowledge that will aid the learning outcomes amongst the PHC workforce, enabling its application in the form of providing improved NCD care to the community.

This report presents our approach towards identifying the potential gaps that may exist in the current NCD training programmes for PHC teams, for the effective delivery of the healthcare interventions recommended for the prevention of T2D and CVD, informed by current guidelines and care pathways. The findings of this report will identify potential opportunities to improve the current training programmes in order to enhance the delivery of T2D and CVD care by PHC Teams, and achieve improved outcomes for T2D and CVD.

We adopted a two-stage approach for the identification of potential areas in which current PHC training programmes for NCD might be strengthened:

1. **Development of skill domains and key skills –** Generating a list of recommended skills and skill domains, relevant to NCD care provided by PHC teams. The lists were compiled for the respective levels of the PHC workforce for effective prevention, early diagnosis and community-based management of T2D and CVD using evidence-based practice and research evidence.
2. **Mapping skills** – The mapping of current training against a compiled recommended skill list to identify the potential gaps that can be strengthened for effective prevention, early diagnosis and community-based management of T2D and CVD.

The findings from this report highlight the skills and knowledge areas which may be incorporated into the existing NCD manuals for the training of PHC teams in Sri Lanka. Our findings provide the basis for future revisions to training programmes that could potentially enable the PHC team to provide improved T2D and CVD care, thereby resulting in enhanced T2D and CVD clinical outcomes in the country.

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3. INTRODUCTION

3.1 Background information

- **Primary health care team for prevention and control of NCDs**

A strong PHC system is essential for delivering effective prevention and control of chronic disease [1]. The PHC systems in South Asian countries such as India, Sri Lanka and Bangladesh typically include physicians, AHPs (eg nurses, midwives, pharmacists, laboratory technicians), and CHWs. Traditionally, chronic disease has been addressed primarily at the level of physicians and AHPs, while CHWs have typically focussed on maternal and child health. However due to the focus on health care in urban areas and developing tertiary care facilities as opposed to primary and secondary care, the existing health systems are ill equipped to handle the current NCD burden across South Asia. There is ineffective NCD care being provided and a lack of community engagement enabling various health promotion activities.

According to research, CHWs can have an effective role beyond maternal and child health. Specifically, their involvement in the prevention, early diagnosis and community-based management of T2D and CVD in low resource settings. Research suggests that CHWs can take on tasks such as screening, providing health education, scheduling referrals and conducting follow-ups amongst members of the community[2,3,4,5]. Along with providing essential healthcare services to the community [6], CHWs are cost effective and well accepted by the community [7] as they share cultural, linguistic and economic backgrounds with the members of the community.

The usefulness and effectiveness of including trained CHWS in interventions to obtain effective clinical outcomes for NCDs has been shown in a number of studies carried out in LMICs including India and Sri Lanka, wherein patients were found to have an improvement in their HbA1c,[8,9] blood glucose,[10,11] systolic,[11],[12,13,14,15] and diastolic,[11,12,14] blood pressure, weight [13,10], waist-hip ratio,[8] waist circumference,[8] BMI [13,10] and cotinine levels [16]. Additionally, a number of randomised controlled trials indicate the positive impact of CHW intervention in knowledge, glycaemic control, low-density lipoprotein level and other risk factor control[17]. Furthermore, a systematic review of trials that utilized CHWs for primary prevention or early detection strategy in the management of NCDs in LMICs revealed that compared with standard care, using CHWs in health programs have the potential to be effective in LMICs, particularly for tobacco cessation, blood pressure and diabetes control[18]. In rural Sri Lanka, findings suggest that CHWs can be trained to provide health education on hypertension and support hypertensive individuals[19]. The available evidence therefore demonstrates, at least in research trials, that an adequately trained PHC team, including CHWs, can bridge the provider gap in low-income nations and provide expanded NCD care.

- **Package of essential non-communicable disease interventions (PEN), HEARTS and skill development of primary health care team**

The WHO has also identified the need for proactive, long-term, patient-centred, community-based and sustainable NCD care, delivered through PHC teams, to achieve impact against NCD at population scale. To facilitate this, the WHO has developed a package of essential NCD interventions (WHO PEN) [20] for PHC teams in low-resource settings. The package includes a prioritized set of cost-effective lifestyle and pharmacological interventions that can be delivered to prevent and control NCDs, including a reduction in tobacco and alcohol consumption, weight regulation, improved diet, increased physical activity, and pharmacological measures for prevention and control of T2D and CVD. The package comes with tools to assess needs and capacity of health system, guidelines to implement

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the interventions, strengthen health system, and evaluate impact. In 2016, WHO in collaboration with the CDC launched another technical package known as HEARTS [21] to focus specifically on prevention and control of CVD. HEARTS is aligned with and builds on the WHO PEN. Their approach typically involves task sharing and incorporates CHWs into care delivery for chronic disease management

The governments of the countries in the South-East Asia region (SEAR) have agreed to adopt both WHO PEN and HEARTS interventions in PHC and have attempted to incorporate the approaches into national guidelines and policy. Bhutan was one of the first countries that piloted the WHO PEN intervention using an integrated approach that included T2D management and involved non-physical health workers in the PHC setting. The implementation of the PEN intervention led to an improvement in blood pressure, diabetes control and a reduction in CVD risk[22]. Additionally, an economic evaluation performed on the PEN intervention for PHC in Bhutan[23] supported WHO's claim that the WHO PEN is cost-effective and feasible to implement in all countries [24].

In other SEAR countries such as in India and Thailand, NCD training manuals have been developed at national and local levels[25] in order to target PHC teams and are stratified by skill level. For example, India has distinct NCD training manuals in the PHC setting for each of the skill levels i.e. MO, AHP and CHW as they recognize that each role varies in terms of their roles and the complexities of the tasks that they are required to carry out.

Although the content of the training packages currently being used by the SEAR countries covers a vast amount of NCD knowledge and skills, the most significant challenge of this remains the translation of the training content delivered to the PHC workforce to the community in the form of appropriate NCD care and thus improved clinical outcomes. The presence of NCD knowledge e.g. disease signs and symptoms, risk factors and complications and administering diagnostic tests in training packages is evident. However, research indicates the importance of including additional skills that have proven to contribute towards achieving enhanced clinical outcomes. Skills pertaining to behavioural skills, skills and techniques that work towards changing one or more determinants of an individual's behaviour such as non-confrontational interviewing skills,[10,11] goal setting,[14] social support,[9,14] counseling,[13,14,16] context tailored advice,[12,14] and increasing health seeking behaviour [15] have been incorporated into PHC trainings for NCD care. Additionally, the effectiveness of incorporating skills that allow the effective delivery of healthcare services such as active listening,[8] problem solving,[10,11,13,14] communication skills and strategies,[8,13] use of equipment and tools,[8, 13] scheduling appointments,[13,14] administering follow- up calls [13] and text reminders,[14] and recording and maintaining documentation [8,9,13,16] for the successful implementation of NCD care in LMIC PHC systems has been demonstrated.

Although there are various factors that contribute to the successful implementation of NCD care in LMIC PHC systems, the quality of training provided to the PHC workforce has proved to be effective in improving clinical measures, behaviours and thus health outcomes in T2D and CVD intervention programmes in LMICs.

Consequently, it is beneficial to ensure that current NCD training manuals for PHC teams in Sri Lanka should adequately cover the required T2D and CVD, behavioural and health service delivery knowledge and skills. The incorporation of the knowledge and skills pertaining to all three areas could possibly result in a comprehensive training programme that could potentially improve the delivery and fidelity of T2D and CVD interventions and thus clinical outcomes in the country.

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3.2 Aim

Our ambition is to evaluate current PHC training programmes for NCD in Sri Lanka to identify potential areas in which these manuals might be strengthened, thereby supporting the effective delivery of interventions for the prevention and control of T2D and CVD by PHC teams.

4. METHODOLOGY

4.1 Team expertise

The members of the GHRU research team were drawn from a variety of disciplines including clinical medicine, NCDs, public health, Bio-technology, technology and were from five countries (India, Sri Lanka, Bangladesh, Australia and England). The members were active in their fields and engaged in investigating, designing and/or delivering T2D and CVD interventions including behaviour change interventions. The members agreed to take part and were actively involved in sharing their discipline expertise.

4.2 Development of skill domains and skills

Given that the PHC workforce is currently unable to provide adequate T2D and CVD care to the community as reflected by the disease burden in the country, it is likely that there is a gap in the skills and knowledge in current PHC training programmes for the two. The GHRU research team compiled a recommended list of skill domains and their respective skills that may aid in bridging the current gap in knowledge and skills. The additional knowledge and skills have been included as a means of enhancing the learning outcomes for the PHC workforce and their ability to apply the knowledge and skills in the form of providing effective and efficient T2D and CVD care to the community.

The components (skill domains and their respective knowledge and skills) have been designed for the 3 respective levels of the primary health care workforce (CHWs, AHPs and MOs) capturing the difference in their roles and their level of complexity. The components include both didactic and practical components for the effective prevention, early diagnosis and community-based management of CVD and T2D.

- **Skill domains**

Three skill domains were developed in an attempt to capture the knowledge and skills required for PHC teams to deliver T2D and CVD interventions. A rigorous literature review indicated that interventions delivered by PHC teams, achieving effective clinical outcomes in low resource settings, trained members of the PHC team with a range of skills and knowledge. The skills and knowledge included in these studies fell under three themes. The first theme was NCD knowledge, consisting of NCD related skills that worked towards their specific study objectives such as providing an overview of the disease, risk factors, complications, anthropometric measurements, calculating BMI, measurement of blood glucose and pulse rate, details of medications for the disease, medication adherence, foot care, lifestyle strategies and guidelines. The second theme was behavioural skills, skills that enable the PHC workforce to move beyond conceptual understanding to demonstrated ability. The skills in this domain included concepts such as interviewing techniques, goal setting, social support, counselling techniques, providing context tailored advice, and ways of increasing health seeking behaviour. The third theme included skills pertaining to service delivery, skills that ensure tasks are executed appropriately such as ethics and confidentiality, use of equipment and tools, scheduling appointments and follow ups and maintaining the required documentation.

In light of the improved clinical outcomes obtained in the studies carried out in LMIC settings, and the persistence of skills and knowledge relating to primarily the three themes in the reviewed studies, the GHRU research team was in agreement with the importance of including the three themes. The team however, named the themes in a way that would provide an indication of their characteristics. Additionally, a description for each domain was included in order for them to be distinct, easily

distinguishable from one another and for this to be an efficient method by which knowledge and skills could be categorized. The three skill domains and their description have been outlined in **Table 1**.

Table 1: Skill domains and their descriptions

Domain	Domain name	Domain Description
1	Knowledge and Clinical skills	Practical understanding of T2D and CVD and clinical skills to manage it (Screening, risk stratification, clinical review of patients, measurements, cut-off values, use of equipment and tools, identifying patients, community mobilisation)
2	Lifestyle intervention and behaviour change skills	Specific capabilities that have been demonstrated to change a behaviour (Healthy Diet, Salt reduction, Weight management, Physical activity, Tobacco cessation, Prevention of harmful use of alcohol and medication adherence)
3	Care delivery skills	Capabilities to manage patient care efficiently and effectively (e.g. record keeping, scheduling appointments and patient care coordination, communication skills, problem solving, basic IT literacy)

- **Knowledge and skills**

After an extensive review of literature to develop the skill domains, the GHRU research team had a wealth of knowledge regarding the knowledge and skills required for the respective skill domains, and those that will aid the successful implementation of T2D and CVD care, by the PHC team for the communities in Sri Lanka. Additionally, the expertise offered by members of the GHRU team was extremely vital and beneficial in the development of the recommended knowledge and skills. A different approach was used to develop the knowledge and skills for each domain.

Domain 1. Knowledge and Clinical skills: The development of the skills and knowledge was supported by research evidence carried out in LMICs, including Sri Lanka wherein the T2D and/or CVD interventions implemented by the PHC workforce resulted in improved clinical outcomes. However, majority of the recommended skills and knowledge were developed after reviewing current NCD guidelines, care pathways along with the clinical expertise offered by the clinicians in the GHRU research team. The initial list of knowledge and skills was developed and reviewed by various members of the team. Appropriate revisions were made before the list was finalised.

Domain 2, Lifestyle intervention and behaviour change skills: After reviewing research carried out in similar settings, the presence of skills relating to this domain were apparent. However, the various types of behaviour change techniques in these studies varied depending on the study objectives. The GHRU research team acknowledged the importance of this domain. However, due to the use of various different behaviour change techniques in each of the studies, the extent to which these

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findings can be generalised across behaviours and health conditions was debatable. Therefore, the decision was taken to include numerous behaviour change techniques that could be applicable to a range of behaviours depending on the change required and could be used in conjunction with other behaviour change techniques to achieve a higher success rate in terms of behavioural changes. Consequently, an extensive taxonomy of 93 consensually agreed, distinct behaviour change techniques [26] was reviewed. The use of these techniques and its effectiveness in previous research led to the decision of using this taxonomy of behaviour change techniques and their associated definitions and examples.

Domain 3. Care delivery skills: The skills for this domain were developed using our findings from our initial research during the development of the three domains that indicated the importance of incorporating skills that enable the PHC workforce to carry out their tasks and provide health care effectively and efficiently. The clinicians on the team provided their insights on the same. There is a lack of evidence on NCD interventions delivered by PHC teams using digital platforms. The technical experts in the team therefore played a crucial role in proposing the skills required by the PHC workforce to provide T2D and CVD care using technology e.g. maintaining patient records on a database, scheduling electronic appointments and referrals, using appropriate medical equipment etc. The initial list of knowledge and skills was developed and reviewed by a number of clinicians and technical experts on the team. Appropriate revisions were made before the list was finalised.

4.3. Mapping skills

The existing NCD training documents for the PHC workforce that are currently being used in Sri Lanka were mapped against the recommended and identified skill domains and their respective skills for the three levels of the PHC workforce. This task required two members of the team (investigators) to go through the list of skills for each domain and mark a skill as being present, not present or one that requires adaptations/enhancements and to provide any additional comments if required. The exercise was carried out with the aim to identify the gaps in the current training documents that could then be added and/or enhanced for effective prevention, early diagnosis and community-based management of T2D and CVD. The steps followed to complete the mapping skills exercise are described below.

- **Existing PHC NCD training documents**

An investigator, whom resided and worked in Sri Lanka was required to provide the most up to date versions of the training documents used to train the PHC workforce in their country (**See Table 2**). These documents could include trainer/facilitator guides, NCD guidelines, tools e.g. flipcharts and posters and any other supplementary materials such as presentations, videos etc. that was used in the delivery of these PHC trainings.

Table 2. Existing NCD training documents for PHC teams

Country	CHW	AHP	MO
India	1. ASHA NCD Module (2017)	1. Multi-Purpose Workers (MPW)-on Prevention, Screening & Control of NCD (2017)	1. Module for MOs for Prevention, Control & PBS of Hypertension, Diabetes & Common Cancer (2017)
Sri Lanka	1. Manual for NCD screening (2012)		

Bangladesh	1. Facilitators' guide for training of trainers on risk factors of Noncommunicable diseases and behavioural interventions (2019) 2. Flip chart NCD version (in Bangla)	1. Facilitator's guide on the Bangladesh package of essential Noncommunicable disease interventions (PEN) for primary healthcare (2019) 2. Participant workbook and personal Health record (2019) 3. Module A, B, C.1, C.2, C.3, C.4, D, E, F, G.1 and G.2 (11 PowerPoint presentations)

- **Mapping procedures**

The mapping exercise was carried out by the in-country and an out of country investigator, both of whom were nominated by the GHRU research team. The investigators were briefed about the aim and the procedures of the exercise and were also given a Standard Operating Procedures manual to ensure the same procedures were followed by both the investigators.

Mapping investigators were requested to provide page/sections numbers as references for when a skill was present. The page/section numbers would come in use, especially when there was a difference in opinion amongst the two investigators.

- **Collating and comparing results**

The results from the two mapping investigators (in and out of country) were compiled and presented alongside each other, to compare the two responses. The investigators' responses were then colour coded to indicate and highlight the following:

Agreements*:* When the two investigators had the same response i.e. Both the investigators marked a skill as being present and provided the same page/section references OR both the investigators marked a skill as NOT being present

Disagreements: When the two investigators have different responses i.e One investigator marked a skill as being present and the other investigator marked the same skill as NOT being present OR the two investigators marked a skill as being PRESENT but provided different page/section references e.g. One investigator provides page numbers 1-5 and the other provides page numbers 31 and 12 as references

Partial agreements: When the two investigators mark a skill as being present BUT provide overlapping page/section references e.g. One investigator provides page numbers 1-5 and the other provides page numbers 4-7 as references

Incomplete skill: When the two investigators mark a skill as being present and both investigators provide comments that mention that the skill is incomplete i.e. partial information for the skill has been presented in the training manual

- **Resolving discrepancies**

When there was a disagreement between the two investigators on whether a skill was present or not, the final decision was taken by introducing a mediator. A meeting was held wherein the in and out of country investigators, along with a central coordinator and a mediator from the GHRU team were

present. The mediator's role was to assess the two responses and refer to the respective training manuals to make a final decision on whether or not the skill was present and, in some cases, if a skill was incomplete and needed adaptation or further enhancements. The mediator's decision and comments were recorded by the central coordinator and was regarded as the final response. All the disagreements between the two investigators were resolved.

5. RESULTS

The analysis generated a list of skills that are present, not present and those that need to be adapted or further enhanced. The analysis was colour coded to indicate the same.

5.1. CHW

(See Appendix *A for the colour coded analysis of the skills and knowledge for Domains 1 – 3*)

For Domain 1 Knowledge and Clinical skills, there were 15 skills that were present and 12 skills that were not present (**Appendix A. Table 1.**). For Domain 2 Lifestyle Intervention and Behaviour Change Skills none of the 16 skills were present (**Appendix A. Table 2.)** and for Domain 3 Care delivery skills there were 2 skills that were present, 14 not present and 2 required adaptations (**Appendix A Table 3).** This analysis indicated that 44 skills required further work to ensure the knowledge and skills required to train the CHWs to provide appropriate T2D and CVD care to the communities is present.

5.2. AHP

(See Appendix B for the colour coded analysis of the skills and knowledge for Domains 1 – 3)

For Domain 1 Knowledge and Clinical skills there were 11 skills presents and 12 skills were not present and 4 required enhancements (**Appendix B. Table 1.**). In Domain 2 Lifestyle Intervention and Behaviour Change Skills, none of the 16 skills were present (**Appendix B. Table 2.)** and for Domain 3 Care delivery skills there were 3 skills that were marked as being present ,14 skills were not present and 2 skills required further enhancements/adaptation (**Appendix B. Table 3.).**In totality, 48 skills for this respective skill level require further work in order for their training component to be complete and consist of the appropriate skills and knowledge required by them to provide appropriate care.

5.3. MO

(See Appendix C for the colour coded analysis of the skills and knowledge for Domains 1 – 3)

In Domain 1 Knowledge and Clinical skills there was a presence of 5 skills ,21 skills were not present and 1 skill required further enhancements (**Appendix C. Table 1.**). In Domain 2 Lifestyle Intervention and Behaviour Change Skills none of the 16 skills were present (**Appendix C. Table 2.)** and for Domain 3 Care delivery skills, 1 skill was present whilst the 4 were not present and 1 required enhancing (**Appendix C. Table 3.).** The analysis therefore demonstrated that 43 skills currently require development in order for this training component to be used train MOs appropriately.

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6. DISCUSSION

The detailed mapping of the existing NCD training manuals for the prevention and control of T2D and CVD for the PHC teams, against a list of recommended skills for them, was essential to Identify the current gap in knowledge and skills. The gap found in knowledge and skills could possibly be a contributing factor to poor clinical outcomes and an increased disease burden.

Our findings provide support that there is a gap in knowledge and skills in the current PHC training curriculums for T2D and CVD. Although the curriculums encompass a vast amount of NCD knowledge and skills as indicated by the presence of skills pertaining to Domain 1: Knowledge and clinical skills, the remaining two domains i.e. Lifestyle and behaviour change techniques and Care delivery skills appear to be lacking. The latter two domains consist of the knowledge and skills that have proven to be successful in achieving improved clinical outcomes in similar settings. The nature of skills and knowledge in Domains 2 and 3 also aid the conversion of the NCD knowledge into practice, thereby allowing PHC members to provide appropriate care to work towards enhanced outcomes. Additionally, Domains 2 and 3 inculcate a practical and interactive approach to providing care which may further aid the understanding of the training content and could be reflective in the improved care provided by the PHC team.

With regard to the presence of the three domains as per the recommended list of skills and knowledge compiled by the GHRU team, Domain 1: Knowledge and clinical skills was more prominent in comparison to the other two domains. It is however important to verify that all the information is up to date as the presence of outdated content may invalidate some of the knowledge and skills that have been marked as being present in this domain. In terms of Domain 2: Lifestyle and behaviour change skills, a few lifestyles and behaviours were covered using a few behaviour change techniques. However, the techniques will need to be discussed and their process explained in a structured way in order for them to be applicable to a range of lifestyles and behaviours as opposed to just one. e.g. A table of various techniques was included in the manual but provided insufficient information on how it can be used to change a specific behaviour and was not applicable to all lifestyle and behaviours. Majority of Domain 3: Care delivery skills were missing from the existing training manuals and are essential to be developed owing to the fact that these skills enable the three levels of the PHC workforce to carry out their duties effectively and efficiently.

The manual that is currently being used was published in 2012. It is important to ensure that the content is verified with the concerned authorities and is kept up to date. Additionally, within the manual, several references have been made to supporting manuals and training material e.g. posters and workbooks. As a result of merely referring to this supplemental material, this material can easily be overlooked. Therefore, such supporting training material should be kept as a set along with the main training manual e.g. numbered with instructions on how and when each document should be used, or this material should be incorporated within the main training manual to ensure all training documents are utilized.

The presence of one training manual, designed for the PHC team does not distinguish the difference in the roles, duties and complexity of knowledge amongst the three skill levels. It is therefore, important to develop separate manuals or sections to provide the PHC team with more clarity in relation to their roles and what is expected of them. This in turn will enable them to provide appropriate care to the community and obtain enhanced outcomes.

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The methodology used to identify the gaps in existing NCD training manuals for PHC teams enabled a thorough exploration of information that is required to develop an effective training package. This extensive exercise provided us with a wealth of information regarding the current skills and knowledge in PHC training manuals, the abilities and capabilities of the PHC workforce, the PHC system, the use of various tools and resources, guidelines and care pathways, details of implementing PHC trainings e.g. training schedules, trainer criteria's etc. This key information will be vital in developing a PHC training package to provide effective T2D and CVD care.

Given the present findings, an imperative is to address the identified gaps in knowledge and skills in the current training manuals by adding the skills and knowledge that are missing or need enhancing and adapting. By continuing to use the current training manuals, similar trends may be found in terms of the quality of T2D and CVD care provided to the community by the PHC teams and therefore poor clinical outcomes. Considering the main source of T2D and CVD information that the PHC teams have access to, are the training manuals, upgrading them by incorporating the identified skills and knowledge may be beneficial and could result in improved outcomes. Furthermore, it is important to acknowledge that the addition and enhancement of knowledge and skills will require clinical expertise, education expert(s) whose expertise lay within the area of public health with a focus on NCDs. Additionally, the ongoing support of the local and national authorities will be essential and valuable for this to be a success.

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7. CONCLUSION

The PHC workforce is an integral part of a country's medical infrastructure. In terms of health, they are the first point-of –contact for the general population, and have deep access into the community. Additionally, given that NCDs are a continuous growing burden on the health economics of any country including SriLanka, , the effectiveness of NCD care provided by PHC teams can therefore shape the health status of the country. The training of the PHC workforce therefore becomes an important aspect in achieving these desired goals. Existing NCD training manuals for PHC teams, target a vast amount of knowledge and skills but at the same time lack a large amount of knowledge and skills especially those pertaining to behavior change techniques and service delivery. The gap in skills may be a contributing factor towards the insufficient T2D and CVD care being provided to community members and therefore poor clinical outcomes in the country.

The incorporation of the identified knowledge and skills that are currently missing from the existing training manuals, will better equip the PHC teams with the skills and knowledge required to provide appropriate care. Furthermore, the addition of skills such as those included in Domain 2: Lifestyle and behavior change techniques and Domain 3: Care delivery skills consist of practical and interactive elements which may improve the acquisition and retention of the knowledge and skills along with increasing levels of motivation and engagement amongst the PHC teams.

The addition and enhancements of the knowledge and skills identified will require clinical and educational expertise, along with the support of the national and local authorities. Once upgraded, this PHC training package could lead to the effective delivery of the training amongst the PHC workforce, thereby enhanced T2D and CVD care provided by them and eventually improved T2D and CVD outcomes in the country.

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9. REFERENCES

1. WHO . Fact Sheet, Primary healthcare .Geneva: World Health Organization; 2019. (https://www.who.int/news-room/fact-sheets/detail/primary-health-care).
2. Joshi R, Alim M, Kengne AP, Jan S, Maulik PK, Peiris D et al. Task shifting for non-communicable disease management in low- and middle-income countries – a systematic review. PLoS One. 2014;9(8):e103754
3. World Health Organization. Task shifting: rational redistribution of tasks among health workforce teams: global recommendations and guidelines. 2007.
4. Gutierrez Kapheim M, Campbell J. Best practice guidelines for implementing and evaluating community health worker programs in health care settings. Chicago: Sinai Urban Health Institute; 2014.
5. Neupane D, Kallestrup P, McLachlan CS, Perry H. Community health workers for non-communicable diseases. Lancet Global Health. 2014.
6. West-Pollak A, Then EP, Podesta C, et al. Impact of a novel community-based lifestyle intervention program on type 2 diabetes and cardiovascular risk in a resource-poor setting in the Dominican Republic. International Health 2014.
7. Dahn B, Woldemariam AT, Perry H, Maeda A, von Glahn D, Panjabi R, et al. Strengthening primary health care through community health workers: investment case and financing recommendations. New York (NY): United Nations; 2015.http://www .mdghealthenvoy.org/wp-content/ uploads/2015/07/CHW-FinancingFINAL-July-15-2015.pdf
8. Ku GM , Kegels G. Integrating chronic care with primary care activities: enriching healthcare staff knowledge and skills and improving glycemic control of a cohort of people with diabetes through the First Line Diabetes Care Project in the Philippines. Global Health Action 2014
9. Less LA, Ragoobirsingh D, Morrison EY, Boyne M, Johnson PA. A preliminary report on an assessment of a communitybased intervention for diabetes control in adults with type 2 diabetes. Fam Pract 2010.
10. Balagopal P, Kamalamma N, Patel TG, Misra R. A Community-Based Diabetes Prevention and Management Education Program in a Rural Village in India Diabetes Care. 2008.
11. Balagopal P, Kamalamma N, Patel TG, Misra R. A community-based participatory diabetes prevention and management intervention in rural India using community health workers. Diabetes Education. 2012.
12. Cappuccio FP, Kerry SM, Micah FB, et al. A community programme to reduce salt intake and blood pressure in Ghana. BMC Public Health. 2006.
13. Xavier D, Gupta R, Kamath D, et al. Community health worker-based intervention for adherence to drugs and lifestyle change after acute coronary syndrome: a multicentre, open, randomised controlled trial. Lancet Diabetes Endocrinol.2016.
14. He J, Irazola V, Mills KT, Poggio R, Beratarrechea A, Dolan J, et al; HCPIA Investigators. Effect of a community health worker-led multicomponent intervention on blood pressure control in low-income patients in Argentina: a randomized clinical trial. JAMA. 2017.

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15. Jafar TH, Hatcher J, Poulter N, et al. Community-based interventions to promote blood pressure control in a developing country: a cluster randomized trial. Ann Intern Med. 2009.

16. Thankappan K, Mini G, Daivadanam M, et al. Smoking cessation among diabetes patients: results of a pilot randomized controlled trial in Kerala, India. BMC Public Health. 2013.

17. Caralise WH, Joan S. Grant, Susan J. Appel An Integrative Review of Community Health Advisors in Type 2 Diabetes. Journal of Community Health. 2011.

18. Jeet G, Thakur JS, Prinja S, Singh M. Community health workers for non-communicable diseases prevention and control in developing countries: evidence and implications. PLoS One.2017.

19. Abdel-All M, Thrift AG, Riddell M, *et al*. Evaluation of a training program of hypertension for accredited social health activists (ASHA) in rural India. BMC Health Serv Res.2018.

20. WHO.Package of essential noncommunicable (PEN) disease interventions for primary health care in low-resourced settings. Geneva: World Health Organization; 2010. http://www.who.int/nmh/publications/essential_ncd_interventions_lr_settings.pdf

21. Technical package of cardiovascular disease management in primary health care .Geneva : World Health Organization; 2016. https://apps.who.int/iris/bitstream/handle/10665/252661/9789241511377-eng.pdf;jsessionid=BB0FBBC4235E9217B98B164EF0F5DAB8?sequence=1

22. Wangchuk D, Virdi NK, Garg R, Mendis S, Nair N, Wangchuk D et al. Package of essential noncommunicable disease (PEN) interventions in primary health-care settings of Bhutan: a performance assessment study. WHO South-East Asia J Public Health. 2014

23. Dukpa W, Teerawattananon Y, Rattanavipapong W, Srinonprasert V, Tongsri W, Kingkaew P et al. Is diabetes and hypertension screening worthwhile in resource-limited settings? An economic evaluation based on a pilot of a package of essential non-communicable disease interventions in Bhutan. Health Policy Plan. 2015

24. WHO. Global Action Plan for the prevention and control of NCDs 2013-2020. Geneva: World Health Organization http://www.who.int/nmh/events/ncd_action_plan/en/.

25. Mahipala P, Dorji G, Tisocki K, Rani M. A critical review of addressing cardiovascular and other non-communicable diseases through a primary health care approach in the South-East Asia Region. Cardiovasc Diagn Ther. 2019

26. Michie S, Richardson M, Johnston M, et al. The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. Annals of Behavioural Medicine. 2013.

10. APPENDICES

Appendix A: CHW Result gap analysis of skills and knowledge for Domains1- 3.

The list of skills that have been colour coded as the following:

Skill Present	Green
Skill Absent	Red
Skill to be enhanced/adapted	Orange

Table 1. CHW, Domain 1 skill gap analysis

Topic	Knowledge/skill	Skill Present (Yes/ No) Comments (if any)
	Background knowledge	
	Purpose: *To have a basic understanding of the following, with the aim to provide culturally appropriate health education and information and navigate participants through the health care system by providing assistance with enrolment and referrals to ensure that participants get the services they need.*	
Non-Communicable Diseases	**1.1** Types and emphasize on the characteristics: chronic, preventable and modifiable	No
T2D and CVD	**1.2** Definition and knowledge of complications	No
T2D and CVD risk factors	**1.3** Risk factors (Excess weight, smoking, sedentary lifestyle and alcohol)	No
T2D and CVD symptoms	**1.4** How to identify common symptoms (Excessive thirst, lethargy, weight loss and non-healing wounds)	No
Public Healthcare system	**1.5** Organisation of the Public Healthcare system and how to navigate through it	No
Public Healthcare workforce	**1.6** Roles and functions of Community Health Workers	No
Community mobilisation	**1.7** Community mobilisation and encouraging participation	No
T2D and CVD Guidelines	**1.8** Overview of evidence-based guidelines	No

Continuous medical education	**1.9** Up-to date knowledge of precise measurement techniques (equipment and process)	Yes
Medical record keeping	**1.10** Recording measurements in the correct units	Yes
Capacity building	**1.11** Health awareness amongst community members	Yes
	2. Measurement and ranges	
	***Purpose**: To administer health screening tests relating to T2D and CVD accurately, and have the ability to identify the need for referral if test values do not fall within the normal range.*	
Blood pressure	**2.1** Measure accurately	Yes
Height	**2.2** Measure accurately	Yes
Weight	**2.3** Measure accurately	Yes
Body Mass Index	**2.4** Calculate correctly	Yes
Blood Glucose	**2.5** Administer test	Yes
Total Cholesterol	**2.6** Administer test	No
	3. Risk stratification	
	***Purpose**: To have the ability to stratify participants according to their T2D and CVD risk status (low, high or disease).*	
T2D and CVD risk status	**3.1** Stratify using WHO 10 - year risk prediction chart	Yes
	4. Advice	
	***Purpose**: To provide basic level advise and to educate participants and their families on the importance of making lifestyle changes.*	
Blood pressure	**4.1** Reduce salt intake	Yes
Body Mass Index and weight management	**4.2** Body weight (measured) is high in relation to height (measured)	Yes
Fasting Blood Glucose (FBG)	**4.3** More than 120mg/dl and HbA1c more than 6.5% indicates Diabetes. In already diagnosed	No

	diabetics a high FBG (more than 120 mg/dl) indicates poor control	
Cholesterol	**4.5** Reducing oil intake, limiting fried foods and consuming healthy oils	No
Smoking	**4.6** Limit/stop active and passive smoking	Yes
Alcohol	**4.7** Reduce consumption	Yes
Fruits and vegetables	**4.8** Increase intake and provide options	Yes
Physical Activity	**4.10** Increase daily/weekly activity	Yes
	5. Follow-up	
	***Purpose**: To evaluate the current health condition of participants by re-taking measurements and re-assessing their health risk. The follow up protocol will guide the participant to appropriate care and ensure that preventative measures can be applied.*	
Protocol	**5.1** Adhere-escalate as per the protocol	No

Table 2. CHW, Domain 2 skill gap analysis

Skill label	Skill Definition	Skill Present (Yes/ No) Comments (if any)
1.Goals and planning	Techniques that help people to set goals for their behaviour or for an outcome of the behaviour (e.g. weight loss) and plan how these goals will be met. Action plans include a description of what will happen in what situation or at what time: how often it will happen, for how long, and where it will take place. Behaviour goals are reviewed in the light of experience and further plans are made according to past progress.	No
2.Feedback and monitoring	A specific behaviour (e.g. alcoholic drinks consumed) or outcome (e.g. changes in weight following changes to diet) is recorded. The person trying to change their behaviour is given feedback on the recorded behaviour or outcomes.	No
3.Social support	Social support involves friends, relatives, or colleagues providing support for people who want to change their behaviour.	No

4.Shaping knowledge	Providing information to increase knowledge on a healthy lifestyle.	No
5.Natural consequences	Providing information about the consequences of the outcomes that happen as a result of behaviour.	No
6.Comparison of behaviour	Provide comparative data (standard behaviour, person's own past behaviour, others' behaviour).	No
7.Repetition and substitution	Prompt repetition of the behaviour in the same context repeatedly so that the context elicits the behaviour and prompts substitution of the unwanted behaviour with a wanted or neutral behaviour.	No
8.Reward and threat	Minimize a person's threats and maximize their rewards in regard to a specific behaviour.	No
9.Regulation	Facilitate the performance of the behaviour by teaching methods to increase the frequency and/or intensity of the behaviour.	No
10. Antecedents	Provide information about antecedents (e.g. social and environmental situations and events, emotions, cognitions) that reliably predict performance of the behaviour.	No
11. Identity	Integrate the behaviour with the identity of the person. The behaviour becomes robust to change because it is so closely linked to central self-views.	No
12. Self-belief	Instil confidence in one's own abilities or judgment to change a behaviour.	No
13. Associations	Introduce or define environmental or social stimulus with the purpose of prompting or cueing the behaviour.	No
14. Comparison of outcomes	Comparing the different outcomes in favour or against the behaviour.	No
15. Scheduled consequences	The withdrawal of something valued if an unwanted behaviour is performed.	No
16. Covert learning	Learning about a behaviour using only mental processes e.g. visualising, predicting, inferring.	No

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Table 3. CHW, Domain 3 skill gap analysis

Skill	Skill definition	Skill Present (Yes/ No) Comments (if any)
1. Data entry	Collecting participant data (paper based and electronically)	Yes
2. Data processing	Create/save/retrieve files, typing, editing documents, generating passwords, creating reports, printing and system navigation	To be enhanced
3. Scheduling appointments and enrolments	Paper based and electronically	To be enhanced
4. Scheduling referrals	Paper based and electronically	No
5. Maintenance of consumables and equipment	Ensuring appropriate maintenance of consumables and equipment (quantity, cleaning and use)	No
6. Data quality	Paper based and electronically	No
7. Basic technology troubleshooting	Basic troubleshooting of equipment, and computer hardware and software and applications	No
8. Speaking	Ability to verbally convey information correctly	No
9. Active listening	Giving full attention to what other people are saying, understand the points being made, asking questions as appropriate, and not interrupting	No
10.Writing	Communicating effectively in writing as appropriate for the needs of others	No
11.Service coordination	Working together with team members	No
12.Service orientation	Actively looking for ways to help people	No
13.Time management	Managing one's own time, dividing time between specific activities appropriately	No
14.Stress Tolerance and management	Accepting criticism and dealing with situations calmly and effectively	No

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15.Problem solving	Identifying problems and reviewing related information to develop and evaluate options and implement solutions	No
16.Cultural competence	Having an awareness of others' views and cultures	No
17.Knowledge of equipment and procedures	Ability to use equipment appropriately and well versed with all operating procedures	Yes
18.Protection of people, data and property	Well versed with the procedures of safeguarding data, people and property	No

Appendix B. AHP Result gap analysis of skills and knowledge for Domains1- 3.

The list of skills that have been colour coded as the following:

Skill Present	Green
Skill Absent	Red
Skill to be enhanced/adapted	Orange

Table 1. AHP, Domain 1 skill gap analysis

Topic	Knowledge/skill	Skill Present (Yes/ No) Comments (if any)
	Background knowledge	
	Purpose: *To have a comprehensive understanding of the following topics with the aim to provide culturally appropriate health education and information and navigate participants through the health care system by providing assistance with enrolment and referrals to ensure that people get the services they need.*	
Non-Communicable Diseases	**1.1** Definition and characteristics (common symptoms) of each type	No
T2D and CVD	**1.2** Definition, complications and early identification of complications	No
T2D and CVD risk factors	**1.3** Risk factors and their identification (**behavioural**: smoking, alcohol consumption, physical activity and **clinical**: BMI, BP, and shortness of breath, blurred vision, swelling of feet, non-healing wounds)	No
T2D and CVD symptoms	**1.4** Diagnosis (Identification of symptoms and investigations), lifestyle modification measures and prevention of complications	No
Public Healthcare system	**1.5** Organisation of the Public Healthcare system and how to navigate through it	No
Public Healthcare workforce	**1.6** Roles and functions of Allied Health professionals	No
Community mobilisation	**1.7** Community mobilisation and encouraging participation	No

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T2D and CVD Guidelines	**1.8** Up-to date recommendations based on evidence-based guidelines	No
Continuous medical education	**1.9** Up-to-date knowledge of precise measurement techniques (equipment and process)	Yes
Medical record keeping	**1.10** Recording measurements in correct units	Yes
Capacity building	**1.11** Health awareness amongst community members and organising educational and teaching activities which will benefit the Community Health Workers	Yes
	2. Measurement and ranges	
	***Purpose**: To administer health screening tests relating to T2D and CVD, interpret results and have the ability to identify the need for referral if test values do not fall within the normal range.*	
Blood pressure	**2.1** Measure and interpret accurately	Yes
Height	**2.2** Measure and interpret accurately	Yes
Weight	**2.3** Measure and interpret accurately	Yes
Body Mass Index	**2.4** Calculate and interpret accurately	Yes
Blood Glucose	**2.5** Administer test and interpret results accurately	Yes
Total Cholesterol	**2.6** Administer test and interpret results accurately	No
	3. Risk stratification	
	***Purpose**: To have the ability to stratify participants according to their T2D and CVD risk status (low, high or disease) and use this information to direct care and improve participants' overall health outcomes.*	
T2D and CVD risk status	**3.1** Stratify using WHO 10 - year risk prediction chart and identify participants' needs and provide case specific care	Yes
	4. Advice	
	***Purpose**: To provide advanced level advise that specifies the details of the lifestyle changes that need to be made by the participant and to educate participants and their families on the importance of making these lifestyle changes.*	

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Blood pressure	**4.1** Salt and oil reduction with specified amount and discuss benefits and adverse effects	Yes
Body Mass Index and weight management	**4.2** Adequate and timely weight reduction and discuss benefits and adverse effects	Yes
Fasting Blood Glucose (FBG)	**4.3** Advise for HbA1c test and discuss benefits and adverse effects of poor control and neglect	No
Cholesterol	**4.5** Limiting the amount of oil consumed per person per month and discuss benefits and adverse effects	No
Smoking	**4.6** Discuss adverse effects of active and passive smoking and benefits of smoking cessation	To be enhanced
Alcohol	**4.7** Limit consumption, daily unit allowance and discuss adverse effects and benefits of limited intake	To be enhanced
Fruits and vegetables	**4.8** Increase intake by _ amount/day, specify types of fruits and vegetables to be eaten, discuss healthier recipes and discuss benefits e.g. targets obesity, antioxidants, healthy for heart and low glycaemic	To be enhanced
Physical Activity	**4.10** Increase and specify types of exercise and specific time spent exercising every day and discuss benefits	To be enhanced
	5. Follow-up	
	***Purpose**: To evaluate the current health condition of participants by re-taking measurements and re-assessing their health risk. The follow up protocol will guide the participant to appropriate care and ensure that preventative measures can be applied.*	
Protocol	**5.1** Adhere-escalate as per the protocol	No

Table 2. AHP, Domain 2 skill gap analysis

Skill label	Skill Definition	Skill Present (Yes/ No) Comments (if any)
1. Goals and planning	Techniques that help people to set goals for their behaviour or for an outcome of the behaviour (e.g. weight loss) and plan how these goals will be met. Action plans include a description of what will happen in what situation or at what time: how often it will happen, for how long, and where it will take place. Behaviour goals are reviewed in the light of	No

	experience and further plans are made according to past progress.	
2. Feedback and monitoring	A specific behaviour (e.g. alcoholic drinks consumed) or outcome (e.g. changes in weight following changes to diet) is recorded. The person trying to change their behaviour is given feedback on the recorded behaviour or outcomes.	No
3. Social support	Social support involves friends, relatives, or colleagues providing support for people who want to change their behaviour.	No
4. Shaping knowledge	Providing information to increase knowledge on a healthy lifestyle.	No
5. **Natural consequences**	Providing information about the consequences of the outcomes that happen as a result of behaviour.	No
6. Comparison of behaviour	Provide comparative data (standard behaviour, person's own past behaviour, others' behaviour).	No
7. Repetition and substitution	Prompt repetition of the behaviour in the same context repeatedly so that the context elicits the behaviour and prompts substitution of the unwanted behaviour with a wanted or neutral behaviour.	No
8. Reward and threat	Minimize a person's threats and maximize their rewards in regard to a specific behaviour.	No
9. Regulation	Facilitate the performance of the behaviour by teaching methods to increase the frequency and/or intensity of the behaviour.	No
10.Antecedents	Provide information about antecedents (e.g. social and environmental situations and events, emotions, cognitions) that reliably predict performance of the behaviour.	No
11.Identity	Integrate the behaviour with the identity of the person. The behaviour becomes robust to change because it is so closely linked to central self-views.	No
12.Self-belief	Instil confidence in one's own abilities or judgment to change a behaviour.	No

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13.Associations	Introduce or define environmental or social stimulus with the purpose of prompting or cueing the behaviour.	No
14.Comparison of outcomes	Comparing the different outcomes in favour or against the behaviour.	No
15.Scheduled consequences	The withdrawal of something valued if an unwanted behaviour is performed.	No
16.Covert learning	Learning about a behaviour using only mental processes e.g. visualising, predicting, inferring.	No

Table 3. AHP, Domain 3 skill gap analysis

Skill	Skill definition	Skill Present (Yes/ No) Comments (if any)
1. Data entry	Collecting participant data (paper based and electronically)	Yes
2. Data processing	Create/save/retrieve files, typing, editing documents, generating passwords, creating reports, printing and system navigation	To be enhanced
3. Scheduling appointments and enrolments	Paper based and electronically	To be enhanced
4. Scheduling referrals	Paper based and electronically	No
5. Maintenance of consumables and equipment	Ensuring appropriate maintenance of consumables and equipment (quantity, cleaning and use)	No
6. Data quality	Paper based and electronically	No
7. Data monitoring	Proactively reviewing and evaluating your data to ensure that it is fit for purpose	No
8. Basic technology troubleshooting	Basic troubleshooting of equipment, and computer hardware and software and applications	No

9. Speaking	Ability to verbally convey information correctly	No
10. Active listening	Giving full attention to what other people are saying, understand the points being made, asking questions as appropriate, and not interrupting	No
11. Writing	Communicating effectively in writing as appropriate for the needs of others	Yes
12. Service coordination	Working together with team members	No
13. Service orientation	Actively looking for ways to help people	No
14. Time management	Managing one's own time, dividing time between specific activities appropriately	No
15. Stress Tolerance and management	Accepting criticism and dealing with situations calmly and effectively	No
16. Problem solving	Identifying problems and reviewing related information to develop and evaluate options and implement solutions	No
17. Cultural competence	Having an awareness of others' views and cultures	No
18. Protection of people, data and property	Well versed with the procedures of safeguarding data, people and property	No
19. Knowledge of equipment and procedures	Ability to use equipment appropriately and well versed with all operating procedures	Yes

Appendix C. MO Result gap analysis of skills and knowledge for Domains1- 3.

The list of skills that have been colour coded as the following:

Skill Present	Green
Skill Absent	Red
Skill to be enhanced/adapted	Orange

Table 1. MO, Domain 1 skill gap analysis

Topic	Knowledge/skill	Skill Present (Yes/ No) Comments (if any)
	Background knowledge	
	Purpose: *To provide effective and efficient T2D and CVD management, culturally appropriate health education and information to prevent T2D and CVD in the community, establish an effective referral mechanism and assist in capacity building of PHC teams.*	
Non-Communicable Diseases	**1.1** Burden at global and national level	Yes
T2D and CVD	**1.2** Burden at global and national level	To be enhanced
T2D and CVD risk factors	**1.3** Screening for risk factors (**T2D**: pedal pulse, sensation on the foot, RBS, regular and retina check **CVD**: BP and ECG)	No
T2D and CVD symptoms	**1.4** Assess symptomology of complications (e.g. burning sensation of the feet)	No
Public Healthcare system	**1.5** Facilities and capabilities of health care centres	No
Public Healthcare workforce	**1.6** Roles and functions of primary health care teams	No
Community mobilisation	**1.7** Identify and target vulnerable population(s) and provide effective and timely referral to specialist centre/care	No

T2D and CVD Guidelines	**1.8** T2D (ADA) and Hypertension (AHA) and up-to-date knowledge of diagnosis, management and complications and standardised care pathways	No
Continuous medical education	**1.9** Up-skill prescribing knowledge (regimens, doses and side effects)	No
Medical record keeping	**1.10** Legible and detailed medical recording and reporting	Yes
Capacity building	**1.11** Engage in educational and teaching activities which will benefit PHC teams	No
	2. Measurement and ranges	
	***Purpose**: To Advise participant for case specific advance testing or to prescribe*	
Blood pressure		No
Height		Yes
Weight		Yes
Body Mass Index		Yes
Blood Glucose		No
Total Cholesterol		No
	3. Risk stratification	
	***Purpose**: To have the ability to correlate medical tests with participants' T2D and CVD risk factors to plan adequate management and refer to specialist (if required)*	
T2D and CVD risk status	**3.1** Provide case specific care, based on participants' risk status	No
	4. Advice	
	***Purpose**: To provide specific e.g. Age, targeted advice. Tailored to address individual needs e.g. prescribing based on co-morbid conditions.*	
Blood pressure		No
Body Mass Index and weight management		No

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Fasting Blood Glucose (FBG)		No
Cholesterol		No
Smoking		No
Alcohol		No
Fruits and vegetables		No
Physical Activity		No
	5. Follow-up	
	***Purpose**: Optimisation of participant medication, and ensuring adequate adherence to lifestyle intervention and medication.*	
Protocol	**5.1** Adhere-escalate as per the protocol	No

Table 2. MO, Domain 2 skill gap analysis

Skill label	Skill Definition	Skill Present (Yes/ No) Comments (if any)
1. Goals and planning	Techniques that help people to set goals for their behaviour or for an outcome of the behaviour (e.g. weight loss) and plan how these goals will be met. Action plans include a description of what will happen in what situation or at what time: how often it will happen, for how long, and where it will take place. Behaviour goals are reviewed in the light of experience and further plans are made according to past progress.	No
2. Feedback and monitoring	A specific behaviour (e.g. alcoholic drinks consumed) or outcome (e.g. changes in weight following changes to diet) is recorded. The person trying to change their behaviour is given feedback on the recorded behaviour or outcomes.	No
3. Social support	Social support involves friends, relatives, or colleagues providing support for people who want to change their behaviour.	No
4. Shaping knowledge	Providing information to increase knowledge on a healthy lifestyle.	No

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5. **Natural consequences**	Providing information about the consequences of the outcomes that happen as a result of behaviour.	No
6. Comparison of behaviour	Provide comparative data (standard behaviour, person's own past behaviour, others' behaviour).	No
7. Repetition and substitution	Prompt repetition of the behaviour in the same context repeatedly so that the context elicits the behaviour and prompts substitution of the unwanted behaviour with a wanted or neutral behaviour.	No
8. Reward and threat	Minimize a person's threats and maximize their rewards in regard to a specific behaviour.	No
9. Regulation	Facilitate the performance of the behaviour by teaching methods to increase the frequency and/or intensity of the behaviour.	No
10. Antecedents	Provide information about antecedents (e.g. social and environmental situations and events, emotions, cognitions) that reliably predict performance of the behaviour.	No
11. Identity	Integrate the behaviour with the identity of the person. The behaviour becomes robust to change because it is so closely linked to central self-views.	No
12. Self-belief	Instil confidence in one's own abilities or judgment to change a behaviour.	No
13. Associations	Introduce or define environmental or social stimulus with the purpose of prompting or cueing the behaviour.	No
14. Comparison of outcomes	Comparing the different outcomes in favour or against the behaviour.	No
15. Scheduled consequences	The withdrawal of something valued if an unwanted behaviour is performed.	No
16. Covert learning	Learning about a behaviour using only mental processes e.g. visualising, predicting, inferring.	No

Table 3. MO, Domain 3 skill gap analysis

Skill	Skill definition	Skill Present (Yes/ No) Comments (if any)
1. Data entry	Collecting participant data (paper based and electronically)	Yes
2. Data processing	Create/save/retrieve files, typing, editing documents, generating passwords, creating reports, printing and system navigation	To be enhanced
3. Scheduling referrals	Paper based and electronically	No
4. Data quality	Paper based and electronically	No
5. Basic technology troubleshooting	Basic troubleshooting of equipment, and computer hardware and software and applications	No
6. Protection of people, data and property	Well versed with the procedures of safeguarding data, people and property	No

11. IMAGES – CURRENT NCD SCREENING ACTIVITIES IN SRI LANKA

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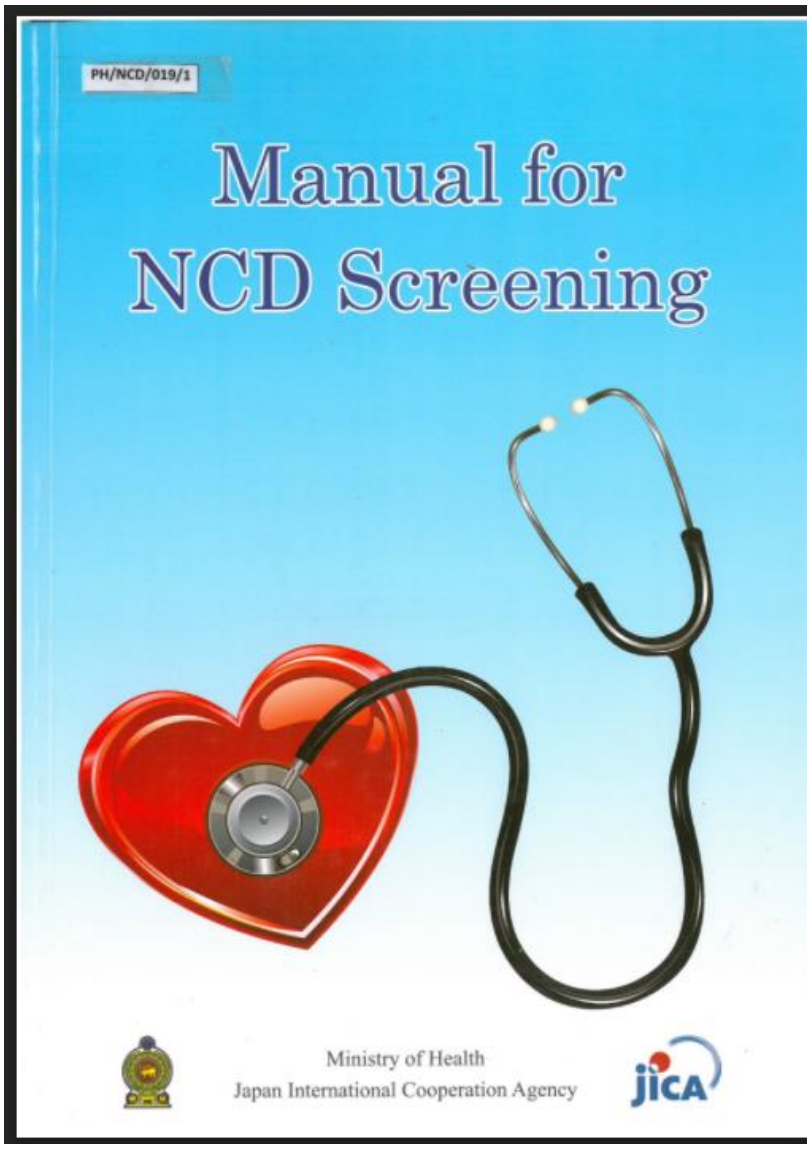
12. MANUAL FOR NCD SCREENING, MINISTRY OF HEALTH, SRI LANKA



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