Setting up a nurse-led model of care for management of Hypertension and Diabetes Mellitus in a high HIV prevalence context in rural Zimbabwe: a descriptive study

Marthe Marie Frieden (marthefrieden@gmail.com)
Medecins Sans Frontieres https://orcid.org/0000-0002-4935-5254
Blessing Zamba
Zimbabwe Ministry of Health and Child Care
Nisbert Mukumbi
Medecins sans Frontieres
Patron Titsha Mafaune
Zimbabwe Ministry of Health and Child Careences
Brian Makumbe
Ministry of Health and Child Care
Elizabeth Irungu
Medecins Sans Frontieres
Virginia Moneti
MEDECINS SANS FRONTIERES
Petros Isaakidis
Medecins Sans Frontieres
Daniela Garone
Medecins Sans Frontieres
Madhu Janina Prasai
Medecins Sans Frontieres

Research article

Keywords: nurse-led, hypertension, diabetes mellitus, mentoring, non-communicable diseases, primary-health-care

Posted Date: February 13th, 2020

DOI: https://doi.org/10.21203/rs.2.14916/v2

Version of Record: A version of this preprint was published at BMC Health Services Research on June 1st, 2020. See the published version at https://doi.org/10.1186/s12913-020-05351-x.

Abstract

Background In the light of the increasing burden of non-communicable diseases on health systems in low- and middle-income countries, particularly in Sub-Saharan Africa, context-adapted, cost-effective service delivery models are required urgently. Multiple models have been trialled across Africa with varying degrees of success. Zimbabwe is a low-income country with unique socio-economic challenges and a dual disease burden of infectious chronic diseases such as HIV and non-communicable diseases. We describe the experience of setting up and organising a nurse-led Diabetes Mellitus (DM) and Hypertension (HTN) model of care in rural Zimbabwe from July 2016 to June 2019. Programme design and implementation We used a conceptual framework successfully applied in the roll-out of antiretroviral therapy in Zimbabwe. Mirroring the HIV experience, we describe key enablers in the design and implementation of the model: decentralization of services, integration of care, simplification of guidelines, mentoring and task-sharing, provision of affordable medicines, quality assured laboratory support, patient empowerment, a dedicated monitoring and evaluation system, and a robust referral system. DM and HTN services were set up in 9 primary health care (PHC) facilities and two hospitals in Chipinge district, and integrated into the general out-patient department or pre-existing HIV clinics. In one hospital, an integrated chronic care clinic (ICCC) emerged. We provided mentoring for staff using simplified protocols, and patient education. Free medication and monitoring with point of care (POC) glycosylated haemoglobin (HbA1c) were provided. Nurses in 7 PHC facilities and one hospital developed sufficient knowledge and skills to diagnose and manage DM and HTN patients, and 3094 patients were registered. Major lessons learned include: the value of POC devices in the management of diabetes; the pressure on services due to added caseload, exacerbated by the availability of free medications; and the importance of leadership in successful programme implementation. Conclusion Our experience demonstrates a model for nurse-led decentralized integrated DM and HTN care in a high HIV prevalence rural, low-income context. Developing a context-adapted model of care is a dynamic process. We present our lessons learned with the intention of sharing experience which may be of value to other public health programme managers.

Introduction

The epidemic of Non Communicable Diseases (NCDs) in Sub-Saharan Africa (SSA), mainly cardiovascular diseases (CVD), cancer, diabetes mellitus (DM) and chronic lung disease, and its impact on existing health systems is increasingly being reported [1, 2]. The Global Burden of Disease study identified hypertension (HTN) and DM as the leading risk factors for early death and disability globally [1]. In Zimbabwe, the overall pooled prevalence of HTN was 30% between 1997 and 2010 [3], while the prevalence of DM has been increasing significantly over the past three decades from 0.44% in 1980 to 5.7% in 2013 [4]. Zimbabwe also has a high HIV prevalence of 14% among adults 15 to 64 years [5]. The overlap between HIV and NCDs is substantial: HIV and its treatment increase the risk of developing HTN and DM [6]; the success of Antiretroviral Therapy (ART) programmes means that increasing numbers of people are surviving long enough to develop NCDs. 14% of people living with HIV (PLHIV) in Zimbabwe currently suffer from at least one NCD, and this figure is expected to double by 2035 [7].

The ART treatment programme is an example of a successful model of chronic disease care in Zimbabwe where the health system is primarily oriented towards management of acute infections and maternal and child health. Various models of DM and HTN care exist worldwide, with gold standard management guidelines for DM and HTN based on western experience, where multidisciplinary teams offer specialized, resource-intensive care. These are poorly adapted for low- and middle-income countries (LMIC), where nurses are the frontline workers attending to patients as they enter the health system at primary health care level (PHC). Models of care for DM and HTN based on task-shifting to non-physician clinicians and decentralisation to primary care have been successfully demonstrated in other countries in SSA [8], but not to our knowledge in Zimbabwe.

Médecins Sans Frontières (MSF) has been supporting the Ministry of Health and Child Care (MOH) in Zimbabwe since 2004 to roll out ART to PHC facilities. In 2016, MSF together with MOH designed and implemented a context-adapted model of care to address the burden of DM and HTN in Manicaland, leveraging lessons learned from the successful ART scale up programme. Although the principle of adapting lessons learned from the HIV experience to NCD programmes is widely recognized [8], there are significant knowledge gaps with regard to practical implementation of the management of NCDs including policies, protocol simplification and standardization, training of staff, and supply of affordable medications and laboratory consumables [9]. We

leveraged our programmatic experience in HIV to implement an nurse-led model of DM and HTN care, decentralised to primary health level, in a rural district of Zimbabwe.

The aim of this paper is to describe the components of our model of care, with particular emphasis on the evolution of the programme as it was implemented and the lessons learned from our experience which may be of value to other NCD programmes in SSA.

Methodology

Design

This is a programmatic description of a model of care for DM and HTN services.

General study setting

The study took place in Chipinge rural district, one of the seven districts of Manicaland in Zimbabwe. The economy is based on subsistence and commercial farming, with low incomes per household [10] . It has a population of over 300,000 [11] served by 51 health facilities. The dirt road network makes some health facilities hard to reach, especially during the rainy season. Chipinge District Hospital (CDH) is the major referral hospital for the North and St Peter's Mission Hospital (SPMH) for the South. Reliable figures on DM and HTN prevalence in Chipinge district have not been documented.

The MOH/MSF Chipinge DM and HTN programme

MOH/MSF began activities in July 2016 in 11 health facilities, offering care for patients with DM and HTN. An MSF mentoring team provided structured teaching sessions and hands-on clinical training to MOH staff, who performed consultations. No NCD-specific guidelines were available in Zimbabwe, therefore MOH/MSF developed simplified context-adapted clinical protocols, training materials and patient literacy tools.

MSF supported MoH to meet the cost of medications and laboratory consumables. Patients who attended health facilities for DM and HTN care were registered in the programme, with 3094 (188 with DM only, 2473 with HTN only, 433 with both DM and HTN) reported between July 2016 and June 2019.

We used automated sphygmomanometers to measure blood pressure (BP) and diagnosed HTN if two out of three readings were ≥ 140/90 mmHg on 3 separate visits (or 2 separate occasions if BP ≥ 180/110 mmHg). Any adult presenting to a health facility in Zimbabwe receives a blood pressure check, and among HIV patients annual screening for HTN is recommended [12]. For DM we adopted a health facility-based opportunistic screening approach according to risk factors such as family history, presence of HTN, HIV, active TB, obesity, CVD or Chronic Kidney Disease (CKD). Diagnosis of DM was based upon a combination of two tests: glycosylated haemoglobin (HbA1c) ≥6.5% and a random blood sugar (RBS) ≥11.1 mmol/L, or a fasting blood sugar (FBS) ≥7 mmol/L. In the presence of severe symptoms of hyperglycaemia, a single high reading of blood glucose confirmed diagnosis (see table 1).

Table 1: Diagnosis of DM: test combinations required

Test 1	Test 2
FBS ≥ 7.0 mmol/L	AND HbA1c ≥ 6.5%
RBS ≥ 11.1	AND HbA1c ≥ 6.5%
FBS ≥ 7.0 mmol/L OR RBS ≥ 11.1 mmol/L AND symptoms of hyperglycaemia	Not applicable No second test required

Those with self-reported conditions were rescreened to confirm the diagnosis, if there was insufficient clinical or documentary evidence to support the accuracy of the initial diagnosis.

For both conditions, active screening in the community was avoided as this has been shown not to be cost-effective [8, 13], and due to concerns that it might overload health facilities with patients.

The treatment initiation threshold for patients with HTN-only was set at BP ≥160/100 mmHg in line with the WHO/ISH risk stratification [14] and standard MSF protocols. For patients with additional risk factors such as diabetes, known CVD or CKD, a lower threshold was chosen (BP ≥140/90 mmHg). The initial treatment target was defined as BP <140/90 mmHg for patients <65 years, and BP <150/90 for patients ≥65 years. Subsequently we simplified protocols, and set a single target of 140/90 for all age-groups.

HbA1c targets for diabetes were initially defined as <8% for <65 years, and <9% for ≥65 years. A single target of <7% for low risk patients independently of age was subsequently chosen within a rationale of simplification. A target of <8% was set for high risk patients (elderly, history of severe hypoglycaemia, multiple comorbidities, long-standing diabetes, limited life expectancy or advanced chronic diabetic complications).

Conceptual framework and key enablers for NCD programmes

Our programme design was based on a conceptual framework [Figure 1] developed by the authors by drawing from MSF's experience on HIV care in SSA including Zimbabwe. We were also inspired by various publications describing successful strategies used in delivering HIV care across the entire health pyramid [15-17]. The mid-section of the framework illustrates the health system. Patients within the community can access their PHC facility for acute or chronic care, and maternal and child health services, where they are attended to by qualified nurses. Where the condition requires expertise, patients are referred to secondary or tertiary levels. Once patients are stable, they are then referred back down through the various levels down to PHC level. The left-hand column highlights the 9 strategic key-enablers of a successful ART programme while the right-hand column mirrors the same strategies for the NCD programme.

Table 2: Enablers, key components of each enabler, and lessons learned during programme implementation (to appear in line 149 under the conceptual framework).

Enabler	Key components	Lessons learned
1. Decentralisation	Service set-up and empowerment of nurses to diagnose and manage DM and HTN	Nurse-led services fully operational in 7/9 PHC facilities and 1 hospital. Spread patient visits throughout the week to manage workload. Difficult to ensure regular access of mentoring teams to remote sites
2. Integration	Two models emerged for NCD integration: either in general OPD or with HIV services.	What works best depends on individual circumstances of each health facility Choose the best fit rather than imposing a 'one size fits all' model
3. Simplification	Context-adapted SOPs Experience-based fine-tuning of clinical treatment	Guideline development is a dynamic process requiring internal and external expertise, responding to user feedback
4. Mentoring and task sharing	Multidisciplinary MSF mentoring teams and MoH mentees Mentoring curriculum comprising clinical and programmatic knowledge On-the-job support by mentor. Competence dashboard to monitor progress	Major limitations: Long travel distance for mentors, HR shortages limiting the availability of dedicated key staff for regular mentoring, high patient volume Requirement for ownership and leadership in health facilities
5. Affordable medicines	Rational medication choices Free medications subsidised by MSF Advocacy to improve MoH medication supply to health facilities	Free medications improved access to care for patients Reliable MSF-supported supply allowed spacing of patient appointments 'Pull factor' of free medications increased programme demand –
6. Quality assured lab support	Use of pre-existing laboratory systems and equipment Introduction of POC machines for glucose and creatinine measurement External Quality Assurance system for HbA1c	Problems with transport of samples to central laboratory overcome by on-site POC machines Trained and motivated laboratory staff required to produce quality results when conventional machines are used
7. Patient empowerment	Individual and group literacy sessions for DM and HTN –	Successful implementation of DM and HTN literacy sessions
8. Dedicated	Design and implementation of	Simplification of patient records improved

Monitoring and Evaluation	patient records for DM and HTN consultations Data collection in electronic database and quarterly analysis Development of standard indicators	completeness and quality of data Dedicated M&E system improved resource quantification
9. Referral system	Development of referral criteria to higher level for complex patients	On- and off-site decision support by doctors

1. Decentralization

Currently, according to the Zimbabwean national policy, diagnosis of DM and HTN is under the responsibility of doctors at hospital level, while refills of selected NCD medications can be given at PHC level. The programme did not aim for coverage of the entire health district, but rather to introduce DM and HTN care at a selection of 11 PHC sites in line with available resources. The site selection process was done together by MOH and MSF. First, we excluded clinics in urban settings and hospitals other than the referral sites. Then, using a quantitative and qualitative evaluation process, rural clinics were scored and ranked according to a set of inclusion and exclusion criteria described in table 3.

Table 3: Criteria for site selection in Chipinge District

Inclusion criteria	Exclusion criteria
Larger size of population served	Number of nurses < 2 per clinic
Larger size of ART cohort	Driving time from district capital to health facility > 90 minutes (one-way)
Higher number of documented cases of NCDs	High turnover of human resources
Higher number of nurses/clinics	Proximity to other possible selected clinics
Stronger recommendation of MOH	Receiving support from other NGOs

At the end of 2018, two PHC sites struggling to adopt the services were dropped from the pilot, while two with satisfactory results but a very remote location were handed over to MOH

2. Integration

In the Zimbabwean ART programme, some health facilities have vertical services exclusively for HIV positive patients, while in other sites care for HIV patients is integrated within the day-to-day general outpatient department (OPD). Thus in our programme, DM and HTN were either managed in an integrated chronic care clinic (ICCC) where patients with HIV and/or NCDs receive care in the same service, or merged with the general OPD [18]. Our aim was to search for the 'best fit' model for service integration for each facility. Regardless of which model was used, when PLHIV had DM or HTN, files would be merged and appointment dates synchronized so that both conditions could be treated at a single visit.

Two out of 9 PHC facilities with existing separate HIV care added and merged DM and HTN management. In 7 out of 9 health facilities the general OPD was the underlying platform for integration. This yielded acceptable results to both staff and patients without compromising existing services. One of these facilities subsequently attempted to move HIV and NCD patients away

from the OPD into an ICCC. However, this stretched pre-existing human resource shortages and the coping threshold was reached when the cohort increased in size forcing them to revert to integrating HIV and NCDs into the general OPD.

At the two secondary care facilities, HIV and OPD services operated independently in separate departments at the inception of the pilot. Our initial approach was to introduce DM and HTN services within the general OPD for HIV negative patients, while separately supporting the HIV department to diagnose and manage DM and HTN among their existing ART cohort. However, at SPMH an overwhelming number of DM and HTN cases began to compromise OPD services. Given the smooth functioning of the HIV department, we decided that this would be a better site to host all DM and HTN care. By building additional clinic infrastructure, adding human resources and optimizing the organization of existing services within the HIV department, we established a well flourishing integrated chronic care clinic (ICCC). CDH continued to operate in two different sites according to HIV status, due to HR challenges and infrastructural constraints. Organisation of DM and HTN care in this hospital did not achieve the same level of service delivery as at SPMH.

3. Simplification

Learning from the ART programme which used simplified clinical guidelines and treatment algorithms to ensure safe use at PHC, we developed standard operation procedures (SOPs) for clinical management, adopted from evidence-based international guidelines, MSF guidelines and experience from projects elsewhere in SSA, aligned with the national medicine formulary [19]. Context adaptation was a dynamic process involving regular reviews with technical support from internal MSF and external specialists, and feedback from the clinicians and care recipients of the protocols (Additional file 1).

An example of simplification is with regard to treatment targets for HTN. Initial targets were looser for elderly patients (age > 65 years) in order to reduce the risk of iatrogenic hypotension. Subsequently, as we observed poor target achievements overall with clinical inertia being a possible significant factor, we simplified protocols by choosing a single target of 140/90 for all age-groups.

4. Mentorship and Task sharing

We adopted a step-wise on-the-job mentoring approach which emphasized knowledge, practical skills and behaviour. The mentors were provided by MSF in three categories: nurses, pharmacy technicians and doctors. The nurses were qualified Registered General Nurses (RGN, three-year diploma) trained in mentorship, with practical experience in mentoring HIV care. The pharmacy technicians had a four-year diploma training in dispensing and pharmacy management. The doctors were general practitioners with significant experience in chronic disease management. All mentors underwent training in DM and HTN care using context-adapted guidelines and on-the job training by MSF supervisors. Mentees from the MOH comprised of RGNs, Primary Care Nurses (18 months training), nurse aides and primary counsellors (lay cadres with ordinary level training and a 6-month training on counselling HIV patients). A mentoring curriculum on organisation of services and DM and HTN care was developed and linked to an evaluation grid to score competencies (the competency dashboard). Mentees would receive an initial theoretical training (one day), then, according to an established schedule, two mentoring teams visited the health facilities every one to two weeks. This on-the-job mentoring cycle was intended for three months, after which mentees would graduate and provide DM and HTN care with periodic on-site and off-site decision support (task-sharing). In certain instances, an extra nurse would be added to the mentoring team to free the MOH nurse undergoing mentorship from her/his usual tasks. Mentoring involved (a) on-site group meetings with all MOH staff with case discussions and lectures on related topics, (b) side-by-side clinical decision support and/or counselling, (c) practical demonstrations of efficient service organisation, including organisation of patient flow and spacing of appointments, and pharmacy management practices. Review meetings were organised in clusters twice a year to analyse performance for a group of health facilities, and to exchange experience.

This mentorship approach allowed a small, mobile team of mentors to set up services in multiple sites simultaneously, thereby accelerating the provision of DM and HTN services and standardising practices across eleven sites. Three sites (one hospital and two PHC clinics) with the highest potential were given a more intensive mentorship schedule and developed as model sites. When sufficient technical capacity was built, patient appointments were spread throughout the week, rather than being clustered on the day of the mentorship visits, and mentorship time was decreased.

7 out of 9 PHC facilities and one hospital achieved sufficient competency-dashboard scores to diagnose, initiate treatment and monitor DM and HTN patients. However, even when dashboard indicators were achieved, the desired knowledge and competencies were attained over a longer period than expected. Challenges for mentors were long travelling time which decreased the daily mentorship coverage or high DM and HTN patient volume on arrival which limited the mentorship time. As noted above, two very remote sites were handed over earlier than planned after having achieved basic skills, in order to free up mentoring time. Due to general human resource (HR) shortages, MOH faced difficulties in freeing up dedicated core staff for regular mentoring, preventing some nurses from completing a full mentoring cycle. To address the problem of staff shortages and high workload, we hired additional staff on short contracts as a temporary solution.

5. Affordable medicines

To standardise treatment, medications were chosen, titrated upwards and different classes added stepwise in consecutive consultations based on clinical and laboratory results. Choice of medications was a compromise between effectiveness, availability, affordability and user friendliness informed by the WHO essential drug list [20], the Zimbabwe national formulary [19] and international guidelines [21, 22].

Before the start of the pilot, NCD medication supply to health facilities was inadequate and inconsistent, with frequent stock outs. Patients received less than a month's supply and had to come more frequently to top up their prescriptions, or even had to buy medications privately. Patients reported taking suboptimal dosages, or not taking treatment at all until it became available. Thus for this programme, medicines and laboratory reagents were largely provided by MSF, and based on MSF principles, they were given for free to all patients registered. The reliable medication supply allowed us to offer three-monthly medication refills for stable patients. A component of advocacy was embedded in the pilot to lobby at facility, district, provincial, national and international levels for resource mobilization for DM/HTN medicines.

However, providing free medications in our pilot proved a pull factor attracting patients from neighbouring districts and provinces. The worsening economic situation in late 2018 further exacerbated this problem and meant that the MoH was not able to increase its responsibility for medication supply, maintaining dependence on MSF.

6. Equipment and quality assured laboratory support

Our programme took advantage of existing MOH staff, infrastructure and equipment. Existing conventional laboratory-based biochemistry machines were used to measure creatinine, blood glucose and HbA1C at hospital level. Despite reinforcement, the existing sample transport system proved to be inefficient as sample transport time was as long as two to three days from the farthest clinics to the hospital laboratory, interfering with the quality of the samples. The laboratories became overloaded and the result turnaround time was long. We then opted for handheld glucometers for diagnosis of DM, and in 2018 introduced point of care (POC) machines for HbA1C (Fine Care®) and creatinine (Novastart®) measurement. All HbA1C testing platforms were enrolled in a monthly External Quality Assurance (EQA) scheme. Table below chronicles the simplification process of the SOPs for diagnosis of DM.

Table 4: Simplification process of SOPs for the diagnosis of DM

	2016	2017	2018	2019
Diagnostic approach At site level	No diagnostic devices used at site level	FBS/RBS on hand-held glucometer	FBS/RBS on hand-held glucometer	FBS/RBS on hand-held glucometer And HbA1c on Point of care platform to confirm
Conventional laboratory (hospital based)	Lab-based FBG	Confirm with lab-based FBG	Not applicable	Not applicable
	Lab-based HbA1c to confirm	Lab-based HbA1c for final diagnosis	Lab-based A1c to confirm	Not applicable
Rationale	Dependency on sample transport (ST) and stability Lab overwhelmed Delays in result reception	Same dependency on ST Lab workload improved Still delays in result reception	Same dependency on ST Lab workload improved. Still delays in result reception Need for motivated HR to follow quality control procedures for HbA1c	Increased autonomy at PHC Faster decision making

We found that the use of conventional laboratory machines for HbA1c needed motivated human resources to follow the quality control procedures required. Performance improved after the introduction of POC devices. DM monitoring with HbA1c is a fairly new concept in SSA where there may be additional sources of error due to haemoglobinopathies or malaria [9], or high HIV prevalence [23, 24]. However, HbA1c measurement was a game-changer against the inconvenience of repeated blood sugar measurements and the poor correlation of these with good glycaemic control.

7. Patient empowerment

This concept involved enabling patients to acquire the knowledge and skills to understand and take responsibility for their own health. Individual and group counselling sessions for DM and HTN emphasised knowledge about glycaemic and blood pressure (BP) control. An active decision not to prioritise defaulter tracing was taken as resources were scarce and we considered there was no public health danger, contrary to contagious diseases such as HIV or TB. In the long run, we aim to differentiate services according to the needs of specific patient subgroups i.e. differentiated service delivery (DSDs) models. At the time of writing this report, DSDs are emerging at community and health facility level.

8. Dedicated monitoring and evaluation (M&E)

Before the programme started, there were no individual patient files for NCD patients.

Health facilities used improvised registers, which did not allow recording of information on follow up and treatment outcomes. There was likely substantial under-diagnosing and underreporting of NCDs.

We designed medical records inspired by the ART patient files and provided them at all sites. The files accommodated both identification numbers for HIV and DM/HTN to enable health workers to identify patients with co-existing conditions and to synchronize appointments. A set of indicators for monitoring and evaluation, following the standard cohort approach used in HIV/TB control programmes, were defined to measure service provision, case-enrolment, follow up, treatment results and retention in care (Additional file 2). Data from patient clinical records were entered onsite or offsite into an electronic database by trained data encoders and were analysed during quarterly review meetings with mentees and managers for use in programmatic decision making. Further support for data evaluation was provided intermittently by MSF technical referents.

With specific and detailed patient records in place, nurses were able to provide improved longitudinal follow up for patients as well as quantifying DM and HTN service demand and medication needs for the programme. In some sites incomplete data was a challenge, and this increased as the cohort sizes grew. A simplified chronic patient card with only key parameters for clinical decision-making was therefore implemented in late 2018. We observed that minimizing the number of variables and storing the patient records close to the consultation area increased completeness of data.

9. Referral system

The focus of this programme was on empowering nurses to manage DM and HTN, thereby minimising referrals to secondary care. Where the management of complex cases exceeded the limits of the care provider, context-adapted criteria were developed to identify these patients in a timely way for consultation by a medical doctor on or off site.

Discussion

Nurse-led models of NCD care have been successfully implemented throughout SSA [25-29]. In Zimbabwe, nurse-led chronic care experience has been drawn mainly from the ART scale up. Thus, responding to the call for context-adapted interventions to address the epidemic of NCDs, we set up this pilot to “learn by doing ” [30] and provide grass-roots level lessons for programme managers. We developed a conceptual framework inspired by HIV experience, consisting of 9 ‘enablers’ which may be used to structure the design and implementation of a treatment programme for HTN and DM in SSA. Using this framework, we successfully set up nurse-led DM and HTN care at 7 PHC facilities and one hospital in rural Zimbabwe, using the principles of simplification of the clinical and programmatic package and integration of NCD care alongside other PHC activities. We demonstrated two potential models for integrating DM/HTN care: inclusion as part of the general OPD, and merging together with HIV care in a special integrated chronic care clinic. However, in 2 of the 9 PHC sites, and in one hospital we were not able to set up successful DM/HTN care. The driving force for the set-up of our programme was a mentorship approach, whereby light, mobile teams of multidisciplinary mentors provide on the job training to MoH mentees through a mixture of formal structured teaching, clinical supervision and programmatic advice. We also developed a system for monitoring and evaluation of the DM and HTN programme, consisting of patient records adapted for longitudinal follow-up, a system of data collection and standardised indicators. We noted that pressure on services was a significant challenge to the successful implementation of our programme, of which one of the major determinants was the attraction of the free medications provided through MSF subsidy.

Multiple integration models have been documented at PHC level, with emphasis on HIV-NCD integration [15, 18, 33]. We saw different models emerging by allowing facilities to follow their natural evolution, which most frequently resulted in the merging of DM and HTN consultations into the general OPD. Interestingly, in Malawi, as services were decentralised from the hospital-based ICCC to PHC level, integration of NCD care into the OPD was resisted due to its complexity and longitudinal nature [18].

We observed that overcoming infrastructural constraints was the key factor in the success of our ICCC model, which is recognised to be key to the effective integration of DM and HTN into an existing health system [15, 34-36]. Thus, one model does not fit all sites, and flexibility and context-adaptation are needed.

One hospital and two PHC facilities were not able to provide nurse-led DM and HTN services autonomously. While inadequate space and lack of HR may have contributed, we feel a major reason for this was lack of clear programme leadership and poor staff ownership of their additional duties. Resistance to take up NCD care, perceived as additional work, has been highlighted in India [37]. In our project, when good leaders emerged and staff were motivated and willing to be mentored, positive results were achieved, and the opposite is true. This too was stressed in Malawi where clear leadership and staff ownership was a key to the success of the project [18]. In real life, we found that such leadership and ownership does not always emerge and a question we remain with is: "what to do in such circumstances." We recommend that policy makers and managers invest time and resources in identifying responsible leaders and motivating staff at all levels for NCD care. During site-selection willingness of the staff to be mentored might also need to be considered. Managers should guide the staff towards rationalizing the overall workload and restructuring workers' schedules to accommodate NCD-related work [37].

We encountered an immediate overwhelming demand in some sites by attracting patients from outside the intended catchment area. This occurred despite our choice not to perform active screening in the community and not to aim for coverage, selecting only 11 out of 51 potential sites in the district. Labhardt et al. in Cameroon offered a decentralized model similar to ours in almost all clinics (69/75) in 8 districts [27], but instead of overcrowding reported low numbers of patients recruited. We noted that access to free medications in our programme seemed to be a major factor attracting patients, exacerbated by the worsening economic situation beginning in late 2018. Unlike for ARTs, access to essential NCD medications is a global challenge albeit some on-going initiatives at various international levels to address this gap [42, 43]. According to 2018 MOH's health sector resource mapping report, the largest funding gap by cost category was for medicines and commodities, and within this category, the percentage of budget allocation by the NCD programme area was less than 2% compared to 71% for the ART programme. A recent study conducted in Zimbabwe on utilisation of health care and burden of out of pocket (OOP) expenditure showed how expenses for NCD care can result in catastrophic health expenditure [24]. Therefore funding models for affordable NCD medications and laboratory consumables need to be considered. Furthermore, forecasting and quantification of consumption of NCD medications is a challenge as the real needs are not known until access to treatment is widened. The mismatch between the demand for NCD medications and supply has been described in other LMIC [44]. In addition, Labhardt et al. argue that non drug-related costs outweigh cost of medication in NCD care management and advocate for decentralization rather than drug subsidies [45]. We agree and envision extension of services to the community, i.e. beyond PHC level, to further reduce costs to patients and improve retention in care, such as simplified services adapted to clinical characteristics, context and different subpopulations. This was successful with the DSD concept in the HIV programme [46]. More research should be done into the acceptability and cost-effectiveness of community-based NCD services. Choice of medications and laboratory investigations should adapt optimal gold standards according to cost-effectiveness.

LIMITATIONS

Full support for mentorship and subsidies for medication and laboratory reagents were sustained throughout the duration of the study. We are therefore not able to ascertain the actual performance of the programme when partner-support is removed. Although we consider our intervention as successful per se, we did not assess its impact on the delivery of other PHC services, such as maternal and child health and acute emergencies. We also did not assess formally the acceptability amongst health workers or patients.

Conclusion

Our experience confirms that the strategies that were successful in implementing HIV programmes can be adopted for the implementation of DM and HTN care within the same context. In particular, decentralization of services with a flexible integration approach is worthwhile considering. Structured mentoring of the nurses on technical knowledge and practice and on organisational aspects should be considered as a key enabler to implement this model. Managers should opt for POC devices for baseline assessment, monitoring of disease progression and evaluation of treatment response. However, free medications,

as with the ART programme, are currently not feasible. Instead programme managers may need to consider low cost medications provided closest to the patients. One strategy to overcome the distance-barrier would be to consider DSDs.

Overall the health system was receptive to nurse-led DM and HTN care. NCD-specific leadership should be considered at provincial and district level to ensure ownership and on-going mentoring support and supervision. The effectiveness of this nurse-led model needs to be further analysed.

List Of Abbreviations

ART: Antiretroviral Therapy; DM: Diabetes Mellitus; DSD: Differentiated Service Delivery; FBS: Fasting Blood Sugar; HbA1C: Glycosylated haemoglobin; HIV: Human Immunodeficiency Virus; HTN: Hypertension; ICCC: Integrated Chronic Care Clinic; LMIC: Low- and Middle- Income Country; MOH: Ministry of Health and Child Care; MSF: Médecins Sans Frontières; NCD: Non-Communicable Diseases; NGO: Non-Governmental Organisation; OOP: Out of Pocket; OPD: Outpatients Department; PHC: Primary Health Care; RBS: Random Blood Sugar; SSA: Sub-Saharan Africa; WHO: World Health Organisation.

Declarations

Ethics approval and consent to participate

The research was approved by the Medical Research Council of Zimbabwe (Approval number: MRCZ/E/2013), which waived requirements for informed consent as this research concerns analysis of programmatic design and implementation and not of patient data. This research fulfilled the exemption criteria set by the Médecins Sans Frontières' Ethics Review Board for a posteriori analyses of routinely

collected clinical data and thus did not require MSF ERB review.

Consent for publication: not applicable.

Availability of data and material: data sharing is not applicable to this article as no datasets were analysed during the current study.

Competing interests: The authors declare that they have no competing interests.

Funding: The publication cost for this article was funded by Médecins Sans Frontières, which supports the NCD pilot project. MF, NM, EI, VM, PI, DG, and MP are MSF employees.

Author's contribution

MF, NM, PM, BM, DG, PI and MP provided the initial conception and design. MF and BZ structured and wrote the manuscript. NM, EI and VM provided analysis and interpretation from the implementer's perspective. All authors contributed to the interpretation and discussions. MP provided critical revision of the article. The final version of the manuscript was seen and approved by all authors.

Acknowledgements

The authors would like to thank the MOH/MSF frontline workers who made this endeavour possible. Special mention to Dr Dorothée Obach for her helpful comments on the manuscript and Ibraheem A Adebayo for his involvement in the initial stages of the manuscript.

Author details

[1]Médecins Sans Frontières, Mutare, Zimbabwe; [2]Ministry of Health and Child Care, Manicaland, Zimbabwe; [3]MSF Southern Africa Medical Unit, Cape town, South Africa; [4]Médecins Sans Frontières, Brussels, Belgium

Marthe Marie Frieden: marthefrieden@gmail.com; Blessing Zamba: bzamba@me.com; Nisbert Mukumbi: MSFOCB-Chipinge-MD@brussels.msf.org; Patron Titsha Mafaune: ptmafaune@gmail.com; Brian Makumbe: brynmakumbe@yahoo.com; Elizabeth Irungu: elizabeth.w.irungu@gmail.com; Virginia Moneti: virginia.moneti@gmail.com Petros Isaakidis: Petros.Isaakidis@joburg.msf.org; Daniela Garone: danielagarone@gmail.com; Madhu Prasai: mjprasai@hotmail.com

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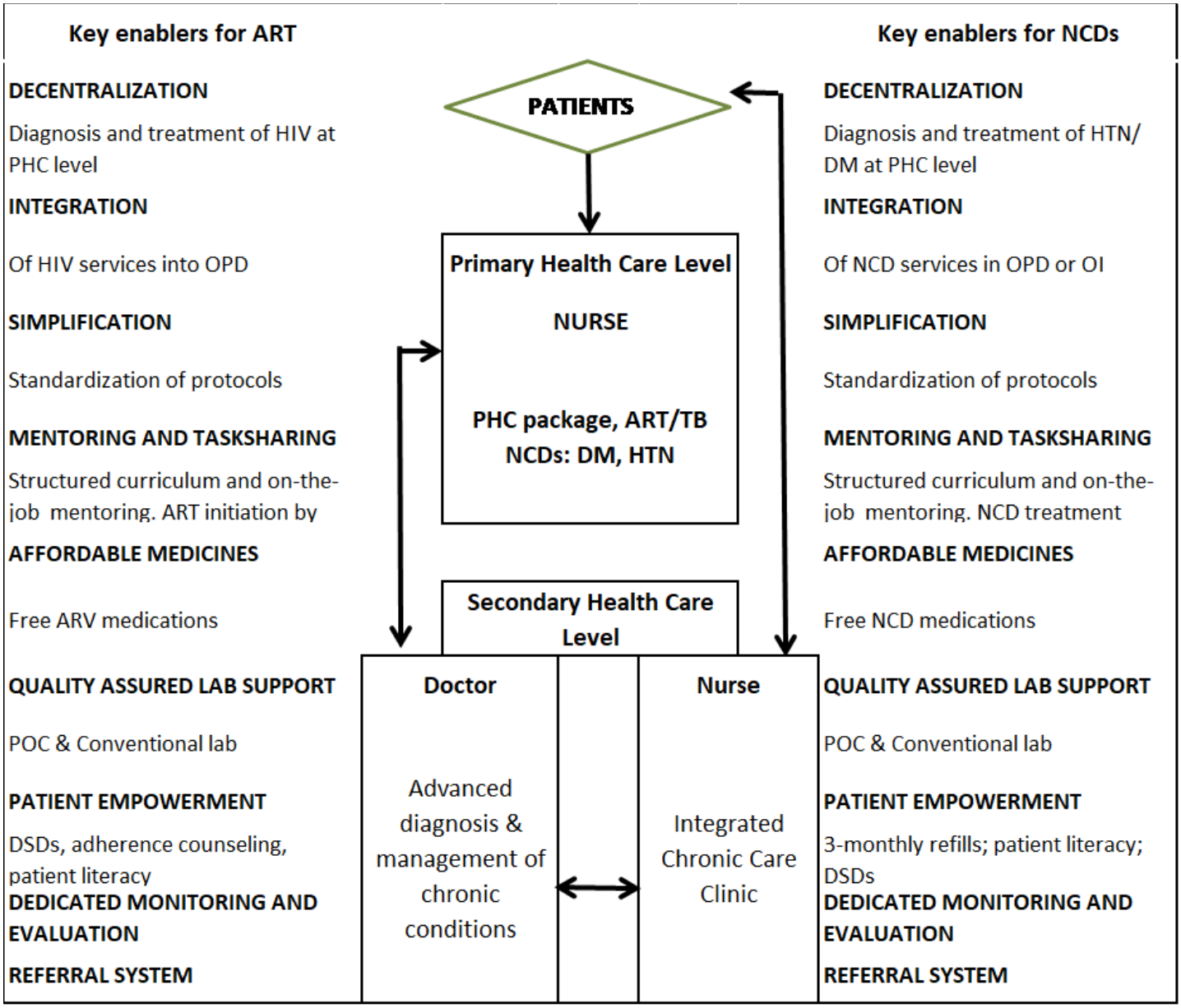
Figures



PHC=primary health care; OPD=outpatient department; OI=opportunistic infections; POC=point of care; DSDs=differentiated service delivery models

Figure 1

Conceptual framework

Supplementary Files

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- ZimHTNDMGuidelinescombined20200127.pdf
- IndicatorsforDMandHTN.xls