Managing and monitoring chronic non-communicable diseases in a primary health care clinic, Lilongwe, Malawi

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Setting: Patients with chronic non-communicable diseases attending a primary health care centre, Lilongwe, Malawi.

Objective: Using an electronic medical record monitoring system, to describe the quarterly and cumulative disease burden, management and outcomes of patients registered between March 2014 and June 2015.

Design: A cross-sectional study.

Results: Of 1135 patients, with new registrations increasing each quarter, 66% were female, 21% were aged ≥65 years, 20% were obese, 53% had hypertension alone, 18% had diabetes alone, 12% had asthma, 10% had epilepsy and 7% had both hypertension and diabetes. In every quarter, about 30% of patients did not attend the clinic and 19% were registered as lost to follow-up (not seen for ≥1 year) in the last quarter. Of those attending, over 90% were prescribed medication, and 80–90% with hypertension and/or diabetes had blood pressure/blood glucose measured. Over 85% of those with epilepsy had no seizures and 60–75% with asthma had no severe attacks. Control of blood pressure (41–51%) and diabetes (15–38%) was poor.

Conclusion: It is feasible to manage patients with non-communicable diseases in a primary health care setting in Malawi, although more attention is needed to improve clinic attendance and the control of hypertension and diabetes.

Chronic non-communicable diseases (NCDs) are now the world’s leading cause of mortality, with a significant and rapidly growing impact in low- and middle-income countries (LMICs).1,2 In 2010, there were 34.5 million deaths (two of every three deaths globally) due to NCDs, with cancer, ischaemic heart disease, stroke and diabetes being the predominant causes.3 Despite the increasing burden of disease and associated mortality, access to prevention, care and treatment remains out of reach for most people in LMICs, and as a result there have been calls for action to improve the situation.4,5

In September 2011, the United Nations convened a high-level meeting on NCDs, and agreement was reached on a goal to reduce NCD deaths by 25% by 2025 in people aged 30–70 years.6,7 This was taken forward into the Sustainable Development Goals (SDG), with SDG 3.4 aiming to reduce premature mortality from NCDs by one third by 2030.8 The targets selected to achieve this goal include reducing elevated blood pressure, smoking cessation, reducing salt intake and increasing physical activity. While there is increasing agreement about the upstream policies required to combat NCDs and reduce NCD mortality, far less is known downstream about how to deliver and monitor quality services for the prevention, care and treatment of chronic disease for the millions of people in need.

In LMICs, patients with NCDs are usually managed in tertiary or secondary level hospitals, but there is an urgent and important need to know how to decentralise and integrate the management of NCDs into primary health care and how to monitor the incidence and prevalence of disease, treatment outcomes and associated morbidity and mortality in this setting. A recent study from Kenya reported on the integrated management of patients with hypertension and/or diabetes in a primary health care setting supported by Médecins Sans Frontières (MSF), with encouraging results.9 There is little information, however, about how this could work at the peripheral level in government settings in other LMICs.

In Malawi, a nationwide World Health Organization (WHO) STEPwise approach to Surveillance (STEPS) survey showed that in 2009 respectively 33% and 6% of the population surveyed had hypertension and diabetes mellitus (DM);10 as a result, a Non-Communicable Diseases Management Unit was established within the Ministry of Health. A national strategy and action plan for NCDs has been developed, including the roll-out of the concept of a ‘chronic care clinic’. Currently, most patients with NCDs such as hypertension, DM, asthma and epilepsy are managed in one of the four national tertiary care facilities, or, in some district hospitals, in specialised out-patient clinics treating one disease at a time on a day separate from any other. Such specialised clinics are difficult for patients with more than one disease, and may not be cost-effective. A decision was therefore made by the Ministry of Health, in collaboration with partners, to pilot the use of chronic care clinics for key NCDs such as hypertension, DM, asthma and epilepsy at the primary health care level.

To test the concept, a chronic care clinic was set up in the primary health care facility in Area 25, Lilongwe, with patient enrolment starting from March 2014. A decision was made to assess the feasibility, challenges, burden of disease and monitoring system during a 12–15 month period soon after the clinic opened in order to identify gaps, correct mistakes and adjust resources to the disease patterns being observed. The aim of this study was to describe the management and monitoring of patients with NCDs in...
this primary health care clinic, along with the burden, treatment and programme outcomes of these patients. Specific objectives were to determine, between March 2014 and 30 June 2015: 1) the number of patients registered in each quarter and cumulatively with the different NCDs; 2) the baseline demographic characteristics, risk factors and existing disease-related complications of all patients who had been cumulatively registered by 30 June 2015; 3) the programmatic outcomes in patients cumulatively registered in the five quarters; and 4) the management and treatment outcomes of patients with specific NCDs.

METHODS

Study design
This was a descriptive cross-sectional study involving patients registered with specific NCDs at Area 25 Health Centre, Lilongwe, Malawi.

Setting
General setting
Malawi is a small country in central Africa with an estimated population of 16.4 million and a nominal gross domestic product of US$226 per capita. It is divided into three regions and has four public tertiary (referral) hospitals and 28 public district hospitals, where health care services are generally free of charge. There are over 700 primary health care centres throughout the country where the majority of the rural population seeks care, although it is unusual for patients with NCDs to be managed in such peripheral settings. The health care worker to patient ratio and physician to patient ratio are amongst the highest in the world, estimated at 1:277 and 1:50000, respectively. The task-shifting of care to lower cadres of health care workers is common at both primary and secondary health care facilities.

Study setting
Area 25 Health Centre serves a catchment population of 80000 adults and children. The chronic care clinic opened formally on 17 March 2014 and started registering patients already under care in the health centre and new patients who were referred or diagnosed with NCDs at the centre. Patients with suspected NCDs are referred to the health centre for diagnosis and care, with a maximum distance between home and the health centre of about 5 km. Once under treatment, patients receive their medications free of charge from the health centre pharmacy. If the health centre has a stock-out of drugs, the patients are advised to go to the public tertiary hospital for their medications. Drugs can be obtained at local pharmacies, but patients have to pay for their medications. The referral, diagnosis, registration, management, monitoring and reporting of NCDs in this centre are briefly described in Table 1.

Study population
All patients registered with NCDs in the Area 25 Health Centre chronic care clinic from 17 March 2014 to 30 June 2015 were included in the study.

Data variables and analysis
The data variables collected in this study included the number of patients with hypertension, DM, asthma and epilepsy newly registered in each quarter and cumulatively registered at the end of each quarter; the demographic characteristics such as sex and age; risk factors for NCDs such as current cigarette smoking (>1 cigarettes per week), alcohol consumption (drinking any alcohol at any time) and obesity (body mass index >30 kg/m²); existing disease-related complications; cumulative programmatic outcomes (see Table 1) and management and treatment outcomes of each NCD (see Table 1 for the quality of NCD control determined by specific indicators). The data were sourced from integrated cohort quarterly reports generated by the electronic medical record (EMR) system and the paper-based database at the Malawi Epidemiology and Research Unit, Lilongwe. These were exported to an Excel spreadsheet (Microsoft Corp, Redmond, WA, USA) and analysed descriptively using percentages and frequencies.

Ethics
The study was approved by the National Health Sciences Research Committee (Lilongwe, Malawi). The study met the MSF Ethics Review Board (Geneva, Switzerland) approved criteria for studies of routinely collected data, and was also approved by the Ethics Advisory Group of the International Union Against Tuberculosis and Lung Disease (Paris, France).

RESULTS
A total of 1135 patients were cumulatively registered in the chronic care clinic between 17 March 2014 and 30 June 2015. The numbers of newly registered patients increased in each quarter, and the cumulative numbers of patients rose by the end of each quarter, as shown in Table 2. Hypertension accounted for 53% of the total cumulative registrations by 30 June, with the remainder of the patients registered with DM (18%), asthma (12%), epilepsy (10%) and hypertension and DM together (7%).

Baseline demographic characteristics, risk factors for NCDs and existing NCD-related complications at the time of registration of all patients are shown in Table 3. There were more females (66%) enrolled into care than males. Of all registered patients, 21% were aged >65 years. Few patients reported cigarette smoking or alcohol consumption. About one fifth of the patients were obese. Only nine patients had disease-related complications (stroke, cardiovascular disease or blindness) at the time of registration.

The programmatic outcomes at the end of five quarters for all patients cumulatively registered during these periods are shown in Table 4. No patient was known to have stopped treatment and there were no known deaths or transfers-out (transfer to other health facilities). In every quarter, a substantial proportion of patients did not attend for unknown reasons, and this remained fairly constant, at about 30% during the last four quarters. One year after the clinic

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Conflicts of interest: none declared.

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had formally opened, the proportion registered as lost to follow-up was 19%.

The management and treatment outcomes in patients with hypertension, DM, asthma and epilepsy during each of the five quarters are shown in Table 5. In patients with hypertension (which included those with hypertension alone or in combination with DM), over 90% were prescribed medication and had their blood pressure measured, but during the last four quarters less than 50% had their blood pressure controlled. In patients with DM (which included those with DM alone or in combination with hypertension), over 90% were prescribed medication and over 80% had their fasting blood glucose measured, but only 15–36% had any blood glucose control. All patients with asthma were always given medication, and 60–75% remained without any serious asthma attack between clinic visits. All patients with epilepsy were always given medication, and 85–94% remained seizure-free between visits.

**DISCUSSION**

This is the first report from Malawi to describe how a chronic care clinic set up at the primary health care level performed during the first 15 months of operation. There were increasing numbers of patients newly registered each quarter, and the cumulative burden of patients with NCDs was over 1000 by the end of 12 months. Hypertension was the predominant problem. There was a low prevalence of smoking and alcohol consumption, but obesity was recorded in one fifth of patients at presentation. Our working definitions for cigarette smoking and alcohol consumption were imprecise, however, and it is possible that the preva-
TABLE 3 Baseline demographic characteristics, risk factors and NCD-related complications at the time of registration in all patients registered in Area 25 Health Centre, Lilongwe, Malawi, by 30 June 2015

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>n (%), All patients</th>
<th>n (%), Male</th>
<th>n (%), Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>All patients</td>
<td>1135</td>
<td>381 (34)</td>
<td>754 (66)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>381 (34)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>754 (66)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age groups, years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0–14</td>
<td>49 (4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15–44</td>
<td>450 (40)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45–64</td>
<td>400 (35)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;65</td>
<td>236 (21)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk factors for non-communicable disease</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current cigarette smoker</td>
<td>5 (&lt;1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumes alcohol</td>
<td>20 (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obese (defined as body mass index (\geq 30 \text{ kg/m}^2))</td>
<td>230 (20)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disease-related complications at the time of registration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous myocardial infarction</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardiovascular disease</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blind</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amputation below the knee</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NCD = non-communicable disease.

Worryingly, a large proportion of patients who did not attend either in the quarter or after 1 year were recorded as lost to follow-up, meaning that they had not been seen in the clinic for \(\geq 1\) year. We do not know whether they were truly not seen or whether this was a feature of missing data. Furthermore, we do not know whether these patients who were lost to follow-up or recorded as non-attending had died or transferred out, and this requires further investigation. Of patients who were seen, it was encouraging that most were prescribed medication, that most of those with hypertension and/or DM had their blood pressure and/or blood glucose measured and that a substantial proportion with epilepsy had their seizures controlled according to our pre-set parameters. Interestingly, less than 10% of patients had both hypertension and DM, much lower than has been found elsewhere.\(^{16,17}\)

This requires further investigation to determine whether patients with DM have their blood pressure measured regularly and vice versa. About a third of patients with asthma had a severe attack in Quarters 2 and 3, compatible with the season of the year when asthma attacks are more frequent in the country.\(^{18}\) Despite medication, the control of blood pressure and DM was generally poor during all of the quarters of the period studied.

The strength of this study is the reporting of the feasibility of running a chronic care clinic within a routine government setting that uses an EMR, with the lessons learnt being applicable to similar settings in Malawi and possibly elsewhere. Furthermore, this observational study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.\(^{19}\)

Limitations relate to the operational nature of the study, which included imprecise definitions of NCD risk factors and a lack of detailed individual information about why patients failed to attend the clinic in the various quarters. It is also possible that some of the patients diagnosed and classified as having asthma had chronic obstructive airways disease.

Several implications result from this study. First, the quarterly and cumulative cohort system that we have set up for chronic disease care generally functioned well, and is similar to systems being implemented for DM and hypertension clinics in central hospitals in Malawi\(^{12}\) and in primary health care centres in other countries such as Jordan.\(^{16,17}\) In these other settings, cohort monitoring relies on an electronic system, as this is probably the only way to follow a cohort of patients with their programmatic and management outcomes that increases cumulatively month by month. Over time, the EMR will also allow a survival analysis of each particular cohort to assess the quality of disease control, the development of co-morbidities and the programmatic outcomes, as has been undertaken in Jordan.\(^{20}\) Such information, updated and produced every quarter, will allow the clinic not only to review and assess the growing case load but also to rationally plan for human resources, drugs and consumables that are needed at the facility level.

We did experience challenges with the EMR in the chronic care clinic in Lilongwe, mainly around ascertaining that each patient visit had been recorded and ensuring that the system is functional at all times; there is a need for a rapid response team linked to government that is consistently available to resolve computer problems when they arise. It has been suggested that clinics run both paper-based and electronic record systems. Anecdotally, this has been done elsewhere in antiretroviral clinics in Malawi, but given the human resource constraints that the coun-

| TABLE 4 Cumulative programmatic outcomes recorded between Quarter 2 2014 and Quarter 2 2015 in patients registered with NCDs at Area 25 Health Centre, Lilongwe, Malawi |
|-------------------------------------------------------------------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Patients with NCDs                                                                             | Quarter 2 2014 n (%) | Quarter 3 2014 n (%) | Quarter 4 2014 n (%) | Quarter 1 2015 n (%) | Quarter 2 2015 n (%) |
| Total number cumulatively registered at the end of the quarter                               | 423 (81)           | 554 (81)           | 704 (81)           | 895 (81)           | 1135 (81)         |
| Attended the chronic care clinic at least once during the quarter                             | 343 (81)           | 318 (57)           | 251 (36)           | 361 (40)           | 576 (51)          |
| Did not attend the clinic in the quarter for unknown reasons                                 | 80 (19)            | 236 (43)           | 453 (64)           | 534 (60)           | 337 (30)          |
| Known to have stopped treatment                                                              | 0                  | 0                  | 0                  | 0                  | 0                 |
| Loss to follow-up*                                                                           | 0                  | 0                  | 0                  | 0                  | 222 (19)          |
| Transferred out to another health facility                                                    | 0                  | 0                  | 0                  | 0                  | 0                 |
| Died                                                                                         | 0                  | 0                  | 0                  | 0                  | 0                 |

*Defined as no consecutive attendance at the clinic for 1 year.

NCD = non-communicable disease.
Attended the clinic in the quarter 79† 56§ 54# 74†† 117§§
DM assessment
Attended the clinic in the quarter 213* 198‡ 108¶ 229** 330‡‡
Blood pressure measured 207 (97) 196 (99) 104 (96) 229 (100) 330 (100)
Blood pressure <140/90
Attended the clinic in the quarter 108 (51) 82 (41) 45 (42) 99 (43) 152 (46)
DM assessment
Attended the clinic in the quarter 79† 56§ 54# 74†† 117§§
Blood pressure measured 74 (94) 52 (93) 50 (93) 71 (96) 113 (97)
Fasting blood glucose performed 70 (89) 50 (89) 45 (83) 60 (81) 111 (94)
Fasting blood glucose <7 mmol/l 20 (25) 21 (38) 8 (15) 19 (26) 38 (32)
Asthma assessment
Attended the clinic in the quarter 30 34 24 19 97
Medication prescribed 47 (100) 71 (100) 74 (100) 70 (100) 86 (100)
No asthma attack in last 3 months 18 (60) 21 (63) 18 (75) 14 (74) 58 (60)
Epilepsy assessment
Attended the clinic in the quarter 47 71 74 70 86
Medication prescribed 47 (100) 71 (100) 74 (100) 70 (100) 86 (100)
No seizure in the last 3 months 40 (85) 67 (94) 69 (93) 65 (93) 75 (87)

*Includes 187 patients with hypertension only and 26 with hypertension and DM.
†Includes 53 patients with DM only and 26 with DM and hypertension.
‡Includes 168 patients with hypertension only and 30 with hypertension and DM.
§Includes 26 patients with DM only and 9 with DM and hypertension.
¶Includes 99 patients with hypertension only and 9 with hypertension and DM.
#Includes 44 patients with DM only and 30 with DM and hypertension.
§§Includes 63 patients with DM only and 54 with DM and hypertension.
‡‡Includes 276 patients with hypertension only and 54 with hypertension and DM.
††Includes 44 patients with hypertension only and 30 with hypertension and DM.
**Includes 199 patients with hypertension only and 30 with hypertension and DM.
†††Includes 44 patients with hypertension only and 30 with hypertension and DM.
‡‡‡Includes 276 patients with hypertension only and 54 with hypertension and DM.
§§§Includes 63 patients with DM only and 54 with DM and hypertension.

References
Resultados: Se registraron 1135 pacientes y los casos nuevos registrados de marzo del 2014 a junio del 2015. Se midió la tensión arterial y la glucemia en 80% a 90% de los pacientes con diagnóstico de hipertensión, diabetes o ambos. Más del 85% se registró como perdidos durante el seguimiento (no acudieron a citas). De los pacientes que acudieron al centro, más del 90% recibió recetas de medicamentos y se midió la tensión arterial y la glucemia en 80% a 90% de los pacientes con diagnóstico de hipertensión y diabetes o ambos. Más del 85% de los pacientes con epilepsia no presentó convulsiones y de los pacientes con asma no sufrió crisis graves. Se observó una regulación deficiente de la tensión arterial (41–51%) y del diabete (15–38%) a été médiocre. De 1135 patients nouvellement enregistrés avec une augmentation chaque trimestre, 66% étaient des femmes, 21% avaient plus de 65 ans, 20% étaient obèses, 53% avaient une hypertension isolée, 18% avaient un diabète isolé, 12% avaient de l’asthme, 10% avaient une épilepsie et 7% avaient à la fois hypertension et diabète. Chaque trimestre, environ 30% des patients ne se sont pas présentés au centre de santé et 19% ont été enregistrés comme perdus de vue (pas vus depuis au moins 1 an) au cours du dernier trimestre. Parmi ceux qui se sont présentés, plus de 90% ont eu une prescription de médicaments et 80% à 90% des patients atteints d’hypertension et/ou de diabète ont eu une mesure de tension artérielle/de glycémie. Plus de 85% des patients avec épilepsie n’ont pas eu de convulsions et 60–75% des patients atteints d’asthme n’ont pas eu de crise grave. Le contrôle de la tension artérielle (41–51%) et du diabète (15–38%) a été médiocre.

Conclusion: Il est possible de prendre en charge les patients atteints de maladies chroniques non transmissibles dans un contexte de centre de santé primaire au Malawi, mais il faut accorder plus d’attention à l’amélioration de la fréquentation du centre et au contrôle de l’hypertension et du diabète.