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

R. C. Manjomo,1 B. Mwagomba,2 S. Ade,3,4 E. Ali,5 A. Ben-Smith,6 P. Khomani,1 P. Bondwe,1 D. Nkhoma,1 G. P. Douglas,7 K. Tayler-Smith,5 L. Chikosi,8 A. D. Harries,3,9 O. J. Gadabu1

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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, ischemic 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 of the week. 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 Malawi.

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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 programme 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.11 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 1:50,000, respectively. The task-shifting of care to lower cadres of health care workers is common at both primary and secondary health care facilities.12

Study setting
Area 25 Health Centre serves a catchment population of 80,000 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 1.14,15

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 programme 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 the chronic care clinic 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 programme 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
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-
We were able to track programmatic outcomes through the EMR, although this required help from the Wellcome Trust database in the Malawi Epidemiology and Research Unit, Lilongwe. Worriedly, 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 ≥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. 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. 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. 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 and in primary health care centres in other countries such as Jordan. 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. 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 country faces.

### 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

<table>
<thead>
<tr>
<th>Patients with NCDs</th>
<th>Quarter 2 2014</th>
<th>Quarter 3 2014</th>
<th>Quarter 4 2014</th>
<th>Quarter 1 2015</th>
<th>Quarter 2 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number cumulatively registered at the end of the quarter</td>
<td>423 (81%)</td>
<td>554 (86%)</td>
<td>704 (84%)</td>
<td>895 (88%)</td>
<td>1135 (70%)</td>
</tr>
<tr>
<td>Attended the chronic care clinic at least once during the quarter</td>
<td>343 (81%)</td>
<td>318 (57%)</td>
<td>251 (36%)</td>
<td>361 (40%)</td>
<td>576 (51%)</td>
</tr>
<tr>
<td>Did not attend the clinic in the quarter for unknown reasons</td>
<td>80 (19%)</td>
<td>236 (43%)</td>
<td>453 (64%)</td>
<td>534 (60%)</td>
<td>337 (30%)</td>
</tr>
<tr>
<td>Known to have stopped treatment</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Loss to follow-up*</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>222 (19%)</td>
</tr>
<tr>
<td>Transferred out to another health facility</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Died</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Defined as no consecutive attendance at the clinic for 1 year.  
NCD = non-communicable disease.
try faces, with increased workload errors creeping in, we believe it is better to use one system or the other rather than trying to operate both simultaneously.

Second, we need to be more precise about classifying patients as smokers and alcohol consumers, with practical definitions available for health care staff in the clinic. The clinic needs to encourage those who smoke to quit.21 As the system matures, we should also consider capturing information about other risk factors such as salt intake and physical inactivity.22 Obesity increases the risk of cardiovascular disease and stroke,23 and there is growing evidence that in DM or pre-DM patients an increase in daily ambulatory activity leads to a reduction in cardiovascular morbidity.24 Interventions to change lifestyle behaviour need to be introduced at chronic care clinics for patients with hypertension and/or DM, and they need to be accompanied by regular and appropriate monitoring.

Third, we need to become better at controlling hypertension and DM to reduce the morbidity and mortality that accompany these conditions. This is not a problem unique to Malawi. DM is generally poorly controlled throughout most of Africa,25 and globally it is estimated that only about 13% of patients with hypertension have their blood pressure controlled.26

Finally, it would be important to be able to quickly identify patients who failed to attend their scheduled appointments so that they can be brought back to the clinic for a visit through either the aid of outreach workers or the use of mobile phone technology, as has been used in antiretroviral clinics in Kenya.27 Prioritising patients with severe hypertension or badly controlled DM is one way of moving forward on this issue and ensuring that these patients do not miss clinic appointments.

In conclusion, we have shown that it is possible to run and monitor registrations and outcomes for patients with NCDs in an integrated chronic care clinic at the primary health care level in Malawi. The evaluation of the clinic at 12 months has been useful in identifying some shortcomings such as EMR functionality, non-attendance and loss to follow-up, and the clinic needs to improve in controlling blood pressure and blood glucose levels in those with hypertension and DM.

References

Método: Utilizando un sistema de electronic seguimiento de las atenciones de salud en Lilongwe, Malawi. Se registraron 1135 pacientes en el primer trimestre de junio 2015. Los pacientes que se presentaron a su consulta se distribuyeron en tres grupos: 66% en el primer trimestre, 32% en el segundo trimestre y 2% en el tercer trimestre.

Resultados: De los 1135 pacientes, 69% tenían hipertensión arterial, 15% tenían diabetes y 1% tenían ambos. En el primer trimestre, más del 90% de los pacientes acudieron al centro, mientras que en el último trimestre, cerca del 70% acudieron. En el último trimestre, más del 90% de los pacientes con hipertensión, diabetes o ambos recibieron recetas de medicamentos. Más del 85% de los pacientes con hipertensión y diabetes tuvieron un control adecuado de sus enfermedades.

Conclusión: En general, los pacientes con hipertensión y diabetes en Malawi obtuvieron buenos resultados de atención primaria de salud. Sin embargo, es necesario mejorar la adherencia a la medicación y el seguimiento de los pacientes con enfermedades crónicas.