
Noncommunicable disease management in resource-poor settings: a primary care model from rural South Africa

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Noncommunicable diseases (NCDs) such as hypertension, asthma, diabetes and epilepsy are placing an increasing burden on clinical services in developing countries and innovative strategies are therefore needed to optimize existing services. This article describes the design and implementation of a nurse-led NCD service based on clinical protocols in a resource-poor area of South Africa. Diagnostic and treatment protocols were designed and introduced at all primary care clinics in the district, using only essential drugs and appropriate technology; the convenience of management for the patient was highlighted.

The protocols enabled the nurses to control the clinical condition of 68% of patients with hypertension, 82% of those with non-insulin-dependent diabetes, and 84% of those with asthma. The management of NCDs of 79% of patients who came from areas served by village or mobile clinics was transferred from the district hospital to such clinics. Patient-reported adherence to treatment increased from 79% to 87% (P = 0.03) over the 2 years that the service was operating.

The use of simple protocols and treatment strategies that were responsive to the local situation enabled the majority of patients to receive convenient and appropriate management of their NCD at their local primary care facility.

Introduction

The prevalence of noncommunicable diseases (NCDs) in developing countries is rising (1, 2) because of increasing life expectancy and changing lifestyles caused by urbanization (3, 4). Combined with the predicted decrease in morbidity and mortality from infectious diseases, the future burden of NCDs is likely to be a major emerging health challenge for developing countries (5). The most common and problematic NCDs encountered in clinical practice in developing countries are hypertension, diabetes, asthma, and epilepsy.

Although primary prevention would ideally form part of a comprehensive NCD programme, the immediate scope for this in resource-poor societies is limited, since it is dependent on improving socio-economic status. Therefore, the focus of this article is on treatment, with the goal of eliminating symptoms

and limiting complications and disability. Responsibility for this lies at the primary care level, which in developing countries is often provided by nurses working in isolated clinics with limited drugs and equipment. Models of NCD management therefore need to be sensitive to training levels of clinic staff, while optimizing available resources.

Described is the establishment and impact of a structured and rationalized NCD service in a rural district of South Africa. The model of care that evolved is applicable in other developing countries and could help cope with the increasing burden of NCDs being experienced at the primary care level.

Methods

Geographical setting

Hlabisa district, in KwaZulu-Natal, South Africa, has a population of approximately 205 000, the vast majority of whom are Zulu. Most people live in scattered rural homesteads, but there is one urban area and a small informal settlement. Income is mainly from subsistence farming, pension remittances, and migrant labour outside the area. The literacy rate is 69% and the life expectancy, 63 years.

Health services

Government health services are provided by a 300-bed district hospital, 10 satellite village clinics that

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Table 1: Steps in the rationalization of the noncommunicable disease service in the study area

Priority issue identified	Intervention planned
<i>Demography</i> No record of patients attending, or diseases seen	Create a clinic-held card register with demographic, diagnostic and management details
<i>Diagnosis and management</i> No defined diagnostic criteria or agreed management plan	Develop diagnostic and management protocols with treatment algorithms. Train primary care nurses in their use
<i>Patient education and self-care</i> Patients unaware of symptoms relating to poor control	Incorporate education and self-care in management protocols
<i>Convenience and adherence</i> Drug dispensing often inconvenient (too far away and too often), with irregular review of control, adherence and side-effects	Prioritize patient convenience, introduce repeat prescription, rationalize drug ordering, monitor adherence and side-effects

offer a 24-hour primary care service, and a mobile clinic service. Clinics are staffed by nurses and a doctor visits once per month, but does not travel with the mobile service. Nurses in the outpatient department of the district hospital provide primary care to the immediate local community. Primary care clinics thus include the village clinics, mobile clinics, and the hospital outpatient department. Patients with NCDs can attend whichever primary care clinic they choose, subject to a government charge of R3 (US\$ 0.75) per consultation, which also covers investigations and drugs. The only laboratory facilities are at the hospital.

Identifying needs and planning interventions

Early in 1993, NCD management was reassessed and discussions were held with patients and health workers. Rational structure was lacking, leaving primary care nurses without guidelines or support. There were no management protocols or an established referral structure, which led to poor levels of disease control, erratic drug ordering, and unnecessary referral from village and mobile clinics to the district hospital. This situation was inconvenient for patients, wasteful of resources, and demotivated clinic staff.

To optimize management of patients with NCDs, we identified key areas for intervention (Table 1), and a district NCD programme was established with the following objectives:

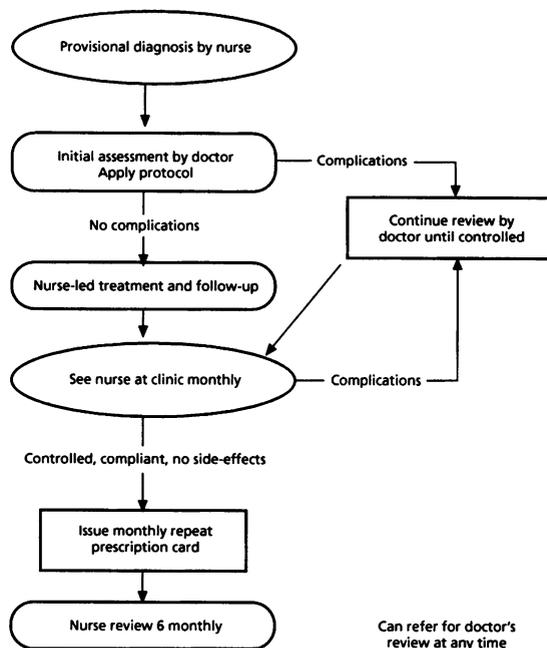
- to describe the demographics of patients with NCDs;
- to develop diagnostic and treatment algorithms that enable nurses to manage most patients with NCDs;
- to transfer patients to their local village clinic for continued NCD care; and

— to improve patient-reported adherence to treatment.

District NCD service

The clinic model designed (Fig. 1) was suitable for use at any of the primary care clinics. Protocols were devised for nurses to diagnose provisionally patients with a new NCD, decide upon initial management,

Fig. 1. Flow diagram for the clinic model.



alter treatment in non-complex cases, and identify patients requiring referral to hospital. Each new NCD patient was seen by a doctor at a primary care clinic for confirmation of diagnosis and detection of complications. Patients with complex conditions continued to be reviewed by a doctor until control was achieved, whereupon they were referred back to nursing staff for management. Optimal control of NCDs was defined clinically (see below), also taking into consideration patient self-reported treatment adherence and treatment side-effects. When optimal control was achieved, a repeat prescription card (RPC) was started, which allowed monthly collection of treatment from any primary care clinic for 6 months without clinical review. Collection of medicines could be delegated by the patient, for example, to a neighbour attending a clinic or to a child attending a school near the clinic. After 6 months of repeat prescriptions the patient's condition was reviewed by a nurse and, depending on whether the control criteria were satisfied, the RPC was reissued or the treatment modified according to the protocol.

Protocol development

Management protocols rationalize care and are believed to reduce morbidity in primary care clinics (6). The protocols we devised were based on available evidence and clinical experience; when available, WHO protocols or national guidelines were adapted to local conditions. The focus was on a clear description of the essential aspects of diagnosis, monitoring, and treatment adherence. Except for hypertension (where control was assessed by blood pressure), monitoring was based entirely on symptoms. The drugs used in the treatment algorithms were all on the local limited drug list and were approved for prescription by nurses. Other drugs, prescribed by the doctor, could be dispensed in primary care clinics. Senior nurses were qualified to modify treatment of hypertension, asthma and non-insulin-dependent diabetes (NIDDM). Treatment for epilepsy and insulin-dependent diabetes (IDDM)^a was prescribed and altered by the doctor until control was achieved, when disease monitoring was continued by nurses. Details of the protocols are described below.

Hypertension protocol. The diagnostic criteria were based on southern African (8) and WHO guidelines current at the time (9), emphasizing measurement

technique and the need for repeated high blood pressure readings before diagnosis (Fig. 2). Therapy was initiated at a persistent systolic blood pressure ≥ 170 mmHg and/or diastolic blood pressure ≥ 100 mmHg. Lifestyle and dietary advice were given, and the first-line drug was a low-dose thiazide, to which increasing doses of methyldopa could be added. This drug cascade follows other schedules of hypertension treatment (10) and it is sensitive to the poor antihypertensive action of beta-blockers in black Africans (11) as well as to the expense and poor availability of ACE inhibitors and calcium channel blockers.

Diabetes protocol. Diagnosis of diabetes was in accordance with WHO criteria (12). Disease control was defined as freedom from symptoms of hyper- and hypoglycaemia, as reported by patients (13). This strategy was a practical response to the unavailability of glucose self-monitoring kits, the dubious value of clinic random blood-glucose measurements (14), inflexible or erratic diets, and the real risk of potentially fatal hypoglycaemia related to insulin or sulfonylureas (15). Education and lifestyle advice were provided and sulfonylureas given in increasing doses, followed by the addition of metformin as necessary (16). If this approach failed to achieve control, insulin could then be initiated by a doctor.

Asthma protocol. Diagnosis of asthma was clinical, based on a history of wheeze or nocturnal cough with clinically detected bronchospasm. Control was defined as freedom from nocturnal symptoms and daytime activity unrestricted by breathlessness. Education and encouragement with inhaler technique were emphasized. The additive treatment cascade followed orthodox guidelines — β_2 -agonist inhaler, steroid inhaler, and oral theophylline (17). If the patient could not master the inhaler technique, a spacer was made using a plastic cup or bottle.

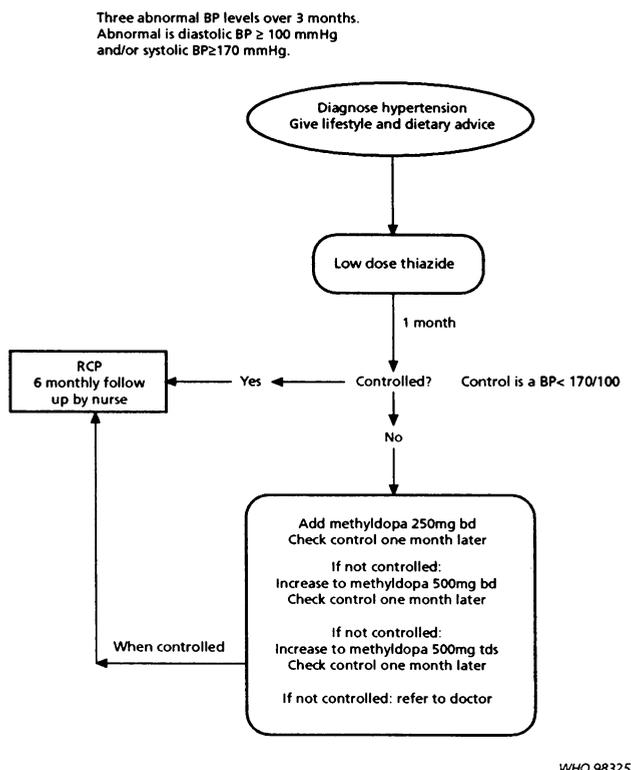
Epilepsy protocol. Diagnosis of epilepsy was entirely clinical, and control was judged by fit frequency, with "acceptable" control being defined by the patient or carer. Home fit charts were successfully introduced. The treatment was adjusted by doctors to achieve control: phenytoin was the drug of choice in adults and carbamazepine in children, many of whom had previously received phenobarbital.

Analysis

The district NCD service records were reviewed 2 years after the service had been established. Demographic and diagnostic details were extracted from all NCD patient records seen in the hospital outpa-

^a IDDM here refers to all patients receiving insulin, and therefore includes some patients who are not truly insulin dependant, but who are treated with insulin. This practice has been identified in South Africa previously (7).

Fig. 2. Flow diagram for the hypertension treatment algorithm (WHO's definition of hypertension is now systolic pressure ≥ 140 mmHg and/or diastolic pressure ≥ 90 mmHg (19)). The level 170/100mmHg could be considered a therapeutic threshold in resource-poor settings or be modified according to local conditions and resources).



tients ($n = 1343$). To assess the extent to which the objectives were achieved, we extracted management details from the records of one-third of the clinic (selected as the first third alphabetically ($n = 448$)). The characteristics of this selected group were compared with the remainder to assess the representativeness of the sample. Frequency distributions of demographic variables, disease patterns, protocol effectiveness, adherence with treatment and transfer to local clinic were calculated using Epi Info 6.1 software.

Results

Demographics and pattern of disease

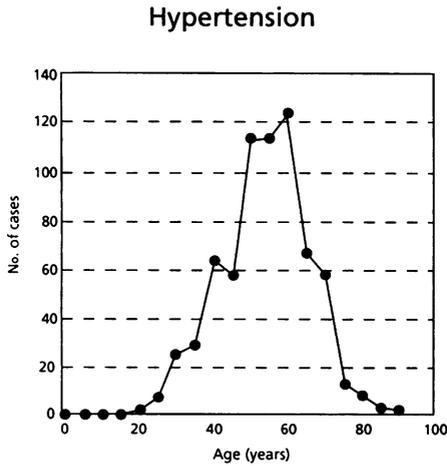
The mean age \pm SD of the total group ($n = 1343$) was 46 ± 20 years (range, 2–95 years). The age distribution of the four main diagnostic groups is shown in Fig. 3. Females outnumbered males by almost 2:1

(65%:35%). This pattern was similar for all the major diagnoses with the exception of epilepsy, where males outnumbered females approximately 4:3 (57%:43%). The period of attendance at clinic ranged from 1 month to 2 years (mean, 15 months).

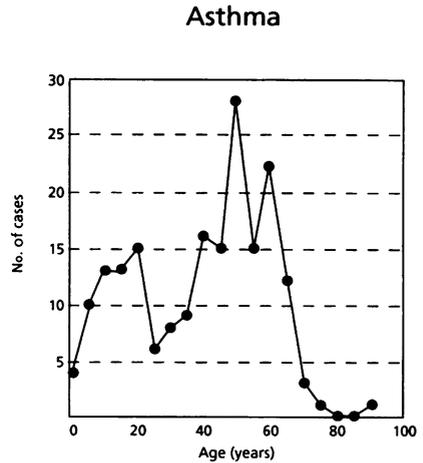
The number and proportion of NCDs seen were as follows: hypertension ($n = 713$, 44%); epilepsy ($n = 208$, 13%); asthma ($n = 201$, 12%); diabetes ($n = 188$, 12%); heart disease ($n = 140$, 9%); other ($n = 166$, 10%). Almost half the patients were hypertensive, and 21% of patients had more than one NCD.

There was no significant difference between the 448 patients selected for more detailed analysis and the remainder of the group, when compared for age, sex, diagnoses or residential area. The results from this subgroup can therefore reasonably be generalized to the whole clinic. Also, there was no significant difference between the pattern of disease at the hospital outpatient clinic and that reported for the village and mobile clinics.

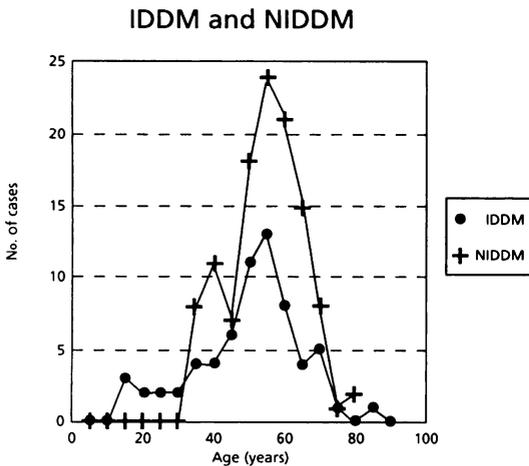
Fig. 3. Age distribution of the study participants, by diagnosis.



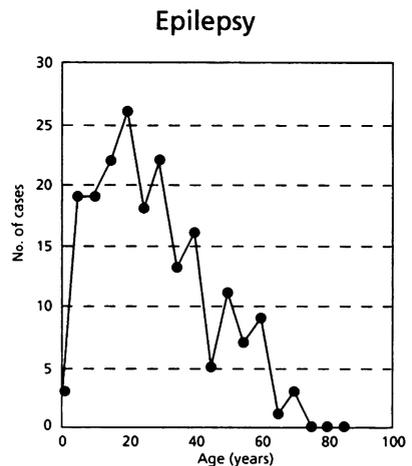
Mean=53 Median=56 Range=18-91



Mean=38 Median=44 Range=3-90



IDDM
Mean=47 Median=52 Range=15-85
NIDDM
Mean=56 Median=59 Range=38-84



Mean=28 Median=26 Range=2-70

WHO 98324

Disease management and control

Management and control were analysed only for patients whose local clinic was the hospital. This excluded patients who were attending the hospital from village and mobile clinics, since they would have introduced bias by over-representing complex problems referred to the hospital. Nurses working alone achieved control of 68% (113/165) of patients with hypertension, 82% (23/28) of those with

NIDDM, and 84% (26/31) of those with asthma (Table 2). The treatment modification to achieve control of IDDM and epilepsy was made by the doctor, as discussed above. Control was achieved in 80% (96/120) of epileptic patients and 83% (10/12) of patients with IDDM; their review was subsequently continued by nurses. Of those patients whose condition was not controlled at the time of this analysis, most were still at some stage on the algorithm, and were therefore classed as being managed by a nurse.

Table 2: Disease control and management

Diagnosis	Control achieved by:		Total controlled
	Nurse + protocol	Doctor's input	
Hypertension (<i>n</i> = 165)	113 (68) ^a	20 (12)	133 (81)
NIDDM (<i>n</i> = 28)	23 (82)	0 (0)	23 (82)
Asthma (<i>n</i> = 31)	26 (84)	3 (10)	29 (94)

^a Figures in parentheses are percentages.

At the patient's most recent clinic visit, the nurses could effectively manage the condition of 92% (151/165) of patients with hypertension, 96% (27/28) of patients with NIDDM, and 97% (30/31) of patients with asthma.

Adherence

Adherence was assessed by patient self-reporting of medicines taken, while maintenance of adherence was facilitated through the use of RPCs and transfer of patients to their local village or mobile clinic when appropriate. Of those patients for whom the hospital was the local clinic, and who attended for more than 1 month, correct adherence was described by 79% (169/215) at their first visit. This improved significantly to 87% (186/215) at the most recent visit ($P = 0.03$).

The hospital was the local clinic for 63% of patients (284/448), while 37% (164/448) had a local village or mobile clinic but attended the hospital, usually because their NCD was difficult to manage. During the 2 years following establishment of the NCD service, 79% (130/164) of patients from another clinic area had their management transferred from hospital to their local clinic, and 83% (236/284) of local patients had qualified for an RPC.

Discussion

Our results demonstrate that appropriate management of patients with NCDs can be achieved in a resource-poor situation by optimizing existing primary care services. Using practical stepwise diagnostic and treatment protocols, nursing staff managed to control most patients with hypertension, NIDDM, and asthma (Table 2). Simplifying drug treatment and collection and rationalizing use of laboratory facilities allowed patients to be conveniently managed at local village clinics. Highlighting under-

standing and acceptance of medication prescribed resulted in significantly improved adherence with treatment. Although KwaZulu-Natal is better served than some resource-poor areas, the principles of this NCD clinic could be adopted to provide convenient and effective management in other developing country settings.

Providing management at local clinics is particularly important for this rural population where the young, elderly and female predominate, since these groups have limited access to transport and little spare time in their daily routine. Such convenient management is possible with the new NCD service. An additional benefit of rationalizing the NCD service would be a reduction in the clinic congestion, which facilitates identification of patients with complex conditions.

Adherence with treatment is a particular issue for patients with NCDs and clinic staff, since it is difficult to sustain motivation for treatment, especially for asymptomatic conditions. Identifying and tackling side-effects, educating on the need for long-term management, simplifying treatment, and involving the patient in agreeing an acceptable drug regimen are vital (18). Implementation of these strategies in the district NCD service significantly improved adherence. The most appropriate method of measuring adherence at clinics in resource-poor areas is patient-reported treatment-taking, although this may result in overestimation. Patient-reporting is a low-technology approach which reinforces health education by emphasizing the contribution of patients and nurses in establishing treatment. That compliance did improve is supported by the observation that most patients' conditions were controlled, and that most qualified for an RPC.

Effective management of the increasing number of patients with NCDs needs to be provided by nurses who have different levels of training, basic equipment and only essential drugs. In resource-poor settings, equity of patient access may be achieved by decentralizing health care. The use of practical clinical protocols optimizes existing resources, and makes convenient and effective treatment a reality.

Résumé

Prise en charge des maladies non transmissibles en milieu défavorisé: un modèle sud-africain de soins de santé primaires

La prévalence des maladies non transmissibles telles que l'hypertension, l'asthme, le diabète et

l'épilepsie est en augmentation dans les pays en développement, ces pays connaissant une phase de transition démographique et épidémiologique marquée par l'allongement de l'espérance de vie et l'urbanisation de leur population. On peut donc s'attendre à une augmentation de la demande de soins pour les malades souffrant de ces affections. Les ressources étant limitées et les pays en développement devant encore faire face à diverses maladies transmissibles et affections périnatales dans un contexte de pauvreté générale, il est nécessaire d'élaborer des stratégies novatrices d'optimisation des services de santé pour qu'ils soient en mesure de prendre en charge les maladies non transmissibles.

Le présent article rend compte de la conception et de la mise en place d'un service des maladies non transmissibles dont la gestion est confiée au personnel infirmier. Ce service, situé dans une zone défavorisée d'Afrique du Sud, repose sur l'utilisation de protocoles cliniques. Le district de Hlabisa, où cette étude a été menée, compte environ 205 000 habitants vivant en majorité sur des exploitations rurales dispersées. Il existe une agglomération urbaine et une zone de peuplement provisoire. Le secteur sanitaire public consiste en un hôpital de district de 300 lits, dix dispensaires satellites implantés dans les villages qui sont ouverts 24 heures sur 24 et des antennes mobiles. Dans les centres de santé de village, la gestion est assurée par le personnel infirmier, tandis que dans les services ambulatoires de l'hôpital de district, ce personnel dispense les soins primaires à la communauté du voisinage. "Les dispensaires ou centres de soins primaires" englobent donc les dispensaires de village, les antennes mobiles et le service de soins ambulatoires de l'hôpital. Les patients qui souffrent d'une maladie non transmissible peuvent choisir le service de soins qu'ils désirent contre paiement à ce service public d'une somme de 3 rands (0,75 USD) par consultation, somme qui inclut également les examens de laboratoire et les médicaments. Seul l'hôpital dispose d'un laboratoire.

Pour établir un plan approprié de prise en charge des maladies non transmissibles, nous avons tout d'abord étudié la prise en charge traditionnelle de ces affections. Nous avons constaté qu'il n'y avait ni planification ni orientation rationnelle des activités mais une dépendance excessive vis-à-vis de l'hôpital de district. Nous avons donc mis au point des protocoles de diagnostic et de traitement que nous avons introduits dans tous les centres de soins de santé primaires du district. Nous n'avons fait appel qu'aux médicaments essentiels et aux technologies appropriées et insisté sur la commodité de la prise en charge pour le patient.

Grâce à ces protocoles, le personnel infirmier a été en mesure de traiter avec succès 68% des hypertendus, 82% des diabétiques non insulino-dépendants et 84% des asthmatiques. Dans 79% des cas, la prise en charge des malades résidant dans des secteurs desservis par les dispensaires de village ou les antennes mobiles et jusqu'ici traités à l'hôpital, a été confiée à ces dispensaires ou antennes. L'observance du traitement (selon les dires des malades) est passée de 79 à 87% ($p = 0,03$) depuis les 2 ans que ce système existe.

Le recours à des protocoles et stratégies thérapeutiques simples et adaptées à la situation locale a permis à la majorité des malades de se faire soigner dans de bonnes conditions par leur centre de soins de santé primaires, sans qu'il soit nécessaire de faire appel à des ressources supplémentaires. Ce système pourrait être appliqué dans d'autres pays en développement.

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