Outcomes of pharmacists' interventions in the collaborative care of patients with diabetes

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Abstract

Objectives: To describe and assess the impact of pharmacists' interventions in the collaborative care of patients with diabetes in a Nigerian hospital.

Methods: Selected patients were randomised into control and intervention groups. The control group received usual hospital care. The intervention group received an additional pharmaceutical care package. After three months, patients' knowledge of the disease management, adherence to the treatment regimen, and blood glucose levels were determined and compared.

Results: There were 99 participants (49 in the control group and 50 in the intervention group). Interventions improved patients' awareness of self-management. Mean preprandial blood glucose before intervention was 9.04 ± 3.469 mmol/L and 5.62 ± 1.243 mmol/L after, ($p < 0.0001$) while peak post-prandial levels were 12.44 ± 4.581 mmol/L versus 7.60 ± 1.824 mmol/L respectively, ($p < 0.0001$).

Conclusion: Pharmacists' active involvement in the collaborative care of patients with diabetes improved patient outcomes.

Keywords: *Clinic setting, diabetes, pharmaceutical care, pharmacists, Nigeria*

Introduction

Diabetes is a chronic illness that is receiving much attention from both the health community and the lay population. Some of the reasons for this interest are the increasing prevalence of the disease, its relationship to other comorbid conditions, an increased awareness of the impact of glucose control on the disease and on these related conditions, and the cost of the disease to society (Umland, 2007).

Patients with type 2 diabetes represent over 80 per cent of the diabetic population and recent clinical outcome studies have made diabetics a target for primary care initiatives to improve the quality of care. Diabetes is now the subject of specific guidelines for community pharmacists (The Society, 1999), which highlight measures for including community pharmacists in the primary care diabetic team. In order to improve clinical outcomes in type 2 diabetics, care should address the management of blood glucose (UKPDS 33, 1998) and blood pressure control (UKPDS 38, 1998) in addition to individualised cardiovascular risk assessment (Ramsay *et al.*, 1999).

The need to improve patient care by coordinating the activities of various health care providers has become a topic of increasing interest in the health care community (McDonough and Doucette, 2001; Papa et al. 1998; Clemmer et al. 1998; Poulton and West 1998; Fagin, 1992). Pharmacists, for example can provide the team with expertise needed to improve a patient's drug therapy and self-care skills (McDonough and Doucette, 2001). The pharmaceutical care model creates an avenue for collaborative patient care. Current pharmaceutical care models suggest that pharmacists need to develop patient care plans and provide effective drug treatments in collaboration with the patient and other caregivers.

Health care systems that have a pharmacist-based diabetes care programme integrated into primary care practice and expanded roles of pharmacists are associated with improved patient outcomes. Pharmacist-based diabetes programmes

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that are integrated into primary care practice reduced HbA1c levels by an average of 1.9% over six months (Rothman *et al.*, 2003). A physician-supervised, pharmacist-managed primary care clinic demonstrated improved patient ability to achieve an HbA1c level of 7% or below, as well as a reduction in the frequency of unscheduled clinic visits (Irons *et al.*, 2002). Patients experience greater satisfaction with their care when pharmacists participate in diabetes care by providing education, coordinating care, adjusting medications, and providing directive guidance behaviors (Singhal *et al.*, 2002; Garrett and Martin, 2003; Cranor *et al.*, 2003). Pharmaceutical care has been associated with decreased direct medical costs of $1,200 per patient per year, and an estimated annual increase in productivity of $18,000 due to reduced sick time (Garrett and Martin, 2003; Cranor *et al.*, 2003).

Our pharmacy practice research team in Nigeria is gradually introducing pharmaceutical care in both hospital and community pharmacy settings. We are focusing on the highly prevalent disease states such as diabetes, hypertension, and malaria as a suitable approach to providing pharmaceutical care. Measuring and reporting the outcomes of pharmaceutical care may provide evidence for its widespread acceptance in a country where pharmacists' involvement in patient care experiences serious barriers.

Table I: Demographics and clinical profile

Item	Control	Intervention
Patients	49	50
Sex:		
Females	26 (53%)	27 (54%)
Males	23 (47%)	23 (46%)
Marital status:		
Married	43 (87%)	42 (84%)
Single/Widowed	6 (13%)	8 (16%)
Social classification		
High	12 (25%)	12 (12%)
Medium	31 (63%)	30 (60%)
Low	6 (12%)	8 (16%)
Age (yr):		
Below 50	16 (33%)	18 (36%)
50 – 60	12 (24%)	8 (16%)
Over 60	21 (43%)	24 (48%)
Diabetic type:		
Type 2	39 (80%)	43 (86%)
Type 1	10 (20%)	7 (14%)
Oral hypoglycemic agents	39 (80%)	43 (86%)
Microvascular complications	7 (14%)	14 (28%)

The objectives of this study were to describe clinical pharmacists' involvement in the collaborative care of patients with diabetes in a Nigerian hospital, and to assess the impact of the interventions on selected patients' reported and clinical outcomes.

Methods

Setting
This investigation was conducted in a medical outpatient clinic run by 13 physicians (three of whom were specialists) and over 20 nurses. Prescriptions were sent to the pharmacy department for filling.

Design
The design was a randomised, single site, controlled study. Different persons handled the processes of data collection, abstraction and analysis.

Data collection procedure
Ethical approval and patients' informed consent were obtained prior to the commencement of data collection. Two pharmacists were trained on a procedure to deliver pharmaceutical care to patients with diabetes. Selected patients who met criteria were randomly assigned into control and intervention groups as they visited the clinic, until a target sample size of about 50 was obtained for each group.

Intervention
Patients in the control group received usual care. Pharmaceutical services provided to this control group were limited to the dispensing of the prescribed medicines and a full explanation on how to use them. In addition, the attending physician, referred the intervention group to the clinical pharmacists who provided an additional pharmaceutical care package. The goals of this package were to provide the patients with information, training, reinforcement and other assistance to help them appreciate their responsibility in managing their condition; and to monitor the patients' drug therapy in order to ensure efficacy and safety of the therapeutic regimens. The patients received a full explanation of the purpose of their prescribed medicines and the importance of refilling their prescriptions at the appropriate time. Attention was paid to patient response to therapy regarding identification of drug related problems. Monitoring parameters included assessment of fasting and two-hour postprandial glycaemia, blood pressure, clinic attendance, as well as adherence to medication, diet and selfcare. We gave positive reinforcement for appropriate patient behaviour and referred problems requiring a change in medication to the attending physician. Each patient visited the clinic twice a week and was followed up for three months.

Data analysis
Baseline patient data were gathered at the beginning and three months after the end of study. Patients' awareness of the disease management, adherence, blood pressure as well as blood sugar levels were determined and compared. Descriptive analysis reported percentage frequency distribution of variables while *Students' t-test* or *Chi-square* test of proportion was performed for inferential statistics as appropriate with the aid of GraphPad Instat version 2.05a, p-values less than 0.05 were interpreted as significant.

Table II: Distribution of patients' awareness of their involvement in diabetic management

Item	Control	Intervention	P-value
Disease	38 (78%)	50 (100%)	<0.0001
Medication	41 (84%)	50 (100%)	<0.0001
Diet	30 (61%)	50 (100%)	<0.0001
Clinic attendance	49 (100%)	50 (100%)	1.0000
Diabetic test	49 (100%)	50 (100%)	1.0000
Exercise	3 (6%)	50 (100%)	<0.0001
Wound prevention	48 (98%)	50 (100%)	0.4773
Foot care	2 (4%)	50 (100%)	<0.0001
Eye care	1 (2%)	50 (100%)	<0.0001
Oral care	1 (2%)	50 (100%)	<0.0001

Results

The demographic profile of the participants showed that 49 and 50 patients with diabetes were in the control and intervention groups respectively. Females were in the majority, 26 (53%) control and 27 (54%) for the intervention group. Type 2 diabetics were 39 (80%) and 43 (86%). Therapy with oral hypoglycaemic agents was indicated in 39 (80%) and 43 (86%) in the control and intervention groups (Table I).

Pharmacists' interventions optimised patients' awareness of the role of diet, exercise, foot care, eye care, adherence to drug therapy, and oral care. Adherence levels were also significantly improved in the intervention group (Tables II and III). Furthermore, the intervention group achieved significantly higher levels of glycaemic control in terms of fasting blood sugar and two-hour post-prandial glucose (Table IV).

A comparison of the blood pressures between the groups showed a mean systolic blood pressure of 131 mmHg ± 15 mmHg versus 136 mmHg ± 22 mmHg for intervention and study groups respectively, (p = 0.18). Also, the respective diastolic blood pressures were 77 mmHg ± 9 mmHg and 83 mmHg ± 11 mmHg, (p = 0.004).

Drug therapy problems found among the patients included patients not knowing how to mix insulin (all ten individuals with type 1 diabetes in the control group and none in the intervention group), unnecessary drug therapy (two intervention patients and 15 control patients), and inappropriate medication adherence was found among two patients in the intervention group and 12 in the control group.

Discussion

Diabetes is a chronic illness that requires continuing medical care and patient self-management education to prevent acute complications and to reduce the risk of long-term complications. Diabetes care is complex and requires many

issues, beyond glycaemic control, be addressed. A large body of evidence exists that supports a range of interventions to improve diabetes outcomes (ADA, 2005). The American Diabetic Association standard for glycaemic control indicates: Hb A_{1C} < 7.0%, preprandial capillary plasma glucose 90 –130 mg/dl (5.0 –7.2 mmol/L), peak postprandial capillary plasma glucose <180 mg/dl (<10.0 mmol/L), and blood pressure < 130/80 mmHg. Though A_{1C} is the primary target for glycaemic control, it was not employed in this investigation because of its prohibitive cost in the country. The outcome of the pharmacists' interventions indicates preprandial capillary glucose and peak postprandial plasma glucose targets were attained in contrast with the control group. There was a significant reduction in diastolic blood pressure but not with the systolic blood pressure. These improvements could be due to the intensive nature of the of the pharmacists' professional relationship with the patients and the patients' considerable improvement in their awareness regarding self-management. It was not certain if the patients would be self-motivated to sustain their active involvement after the study period.

These findings are consistent with an earlier report that demonstrated the effectiveness of pharmaceutical care in the

Table III: Comparison of the level of adherence between control and intervention groups

Item	Control	Intervention	P-value
Medication adherence	23 (47%)	48 (96%)	< 0.0001
Diet adherence	22 (45%)	45 (90%)	< 0.0001
Test adherence	32 (62%)	43 (86%)	0.0002
Clinic attendance adherence	34 (69%)	47 (94%)	0.0001

Table IV: Comparison of blood glycaemic levels

Item	Control	Intervention
Number of patients	49	50
Mean fasting blood sugar (mmol/L)	9.04 ± 3.469	5.62 ± 1.243
Two-hour post-prandia (mmol/L)	12.44 ± 4.581	7.60 ± 1.824
		P < 0.0001

reduction of hyperglycemia associated with NIDDM in a group of urban African-American patients (Jaber *et al.* 1996). Another study has also demonstrated a feasible pharmaceutical care model for diabetes patients in a European country. The pharmacists in that study were found to be effective and well accepted by GPs and patients (Wermeille et al 2004).

In fact there are several of such studies in the literature and most of them are in the developed countries where pharmacy practice appears to be advancing. This form of collaborative care is novel in Nigerian hospitals. The improvements in patient outcomes were due to collaboration among the different caregivers, with an active involvement of clinical pharmacists in the setting.

Staff at this health care facility appreciated the pharmacists' novel contributions to patient care and accepted the project but there was however not yet a policy to maintain pharmacists' collaboration in patient care. Future research involving more patients, multicentres and wider collaboration among health care givers may help to generate a policy statement at national level.

Patients with diabetes mellitus often lack sufficient knowledge about their disease and thus frequently have poor self-management skills. Improving patients' knowledge of diabetes self-care practices will allow them to better contribute to their care and is a small investment with a large benefit. Regular assessment of patients' skills and knowledge is critical. Administering a written or oral evaluation with each outpatient visit can easily make this assessment. It will therefore be necessary to develop a tool for knowledge assessment. This should be based on local languages considering the literacy level in Nigeria. Such a tool that can be self-administered can facilitate this process, both for patients who visit their health care practitioners regularly, and for those who do not. This in turn may identify specific patient characteristics that may improve patients' ability to manage their own care. In addition, test scores can provide practitioners with valuable information that may prompt them to further teach patients about a specific self-care practice.

In spite of the importance of diet in the management of diabetes mellitus, patients are often unaware of its place in ensuring good glycaemic control. Consequently, adherence to dietary advice remains poor among patients with diabetes. The importance of structured dietary advice and dietary control in type 2 diabetes cannot be over-emphasised. In most health care settings in Nigeria dieticians are scarce; pharmacists involved in the care of patients with diabetes must be skilled in the dietary management of the condition and show commitment to it.

Conclusion

Pharmacists' interventions improved patients' awareness of self-management. The outcome of the pharmacists' interventions indicates preprandial capillary glucose and peak postprandial plasma glucose targets were attained in contrast with the control group. Pharmacists' active involvement in the collaborative care of patients with diabetes improved patient outcomes.

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