Pharmacist-led medication therapy management of diabetes club patients at a primary healthcare clinic in Cape Town, South Africa: A retrospective and prospective audit

F Sonday, MPharm; **A Bheekie,** MPharm, PhD; **M van Huyssteen,** MPharm, PhD

School of Pharmacy, Faculty of Natural Sciences, University of the Western Cape, Cape Town, South Africa

Corresponding author: *F Sonday (fsonday786@hotmail.com)*

Background. Diabetes mellitus (DM) is a complex chronic condition and remains a public health concern worldwide. In South Africa (SA), many patients with DM access public sector primary healthcare clinics, and those who are considered to be stable are referred to the club system, which is managed by a multidisciplinary team. Patients who have DM are often diagnosed with concurrent medical conditions, resulting in multiple medication therapies that lead to medication therapy problems (MTPs). Prescriber adherence to standard treatment guidelines (STGs) is aimed at improving glycaemic control to minimise complications and decrease healthcare costs. The pharmacist's role in medication therapy management (MTM) for DM is underutilised in public sector healthcare facilities.

Objectives. To evaluate the implementation of a pharmacist-led MTM intervention to optimise the management of stable patients with type 2 DM attending a diabetes club at a Cape Town community day centre.

Method. An evaluation study design using a case study approach was conducted over 8 months from November 2016 to June 2017. A retrospective and prospective audit was conducted from patient folders of stable patients who attended the club. Quantitative data were extracted from the folders. A trained pharmacist audited baseline (pre-intervention) data. Prescribing staff were notified of therapeutic discrepancies through written pharmacist's pharmacotherapeutic recommendations (intervention). Pharmacist-led interventions audited prescriber adherence to SA STGs and the Essential Medicines List, and prescriber responses to the pharmacist's recommendations (post-intervention) were recorded as accepted, partially accepted or rejected. Estimated costs were calculated for rational and irrational prescribing of aspirin during the MTM process.

Results. Of 104 patient folders audited, most were for females (n=70; 67.3%). A total of 453 MTPs were identified, averaging four interventions per folder reviewed. The most common MTPs identified were the absence of basic clinical data: *body mass index not documented* (22.5%) in the folder, *no medical indication noted* (19.2%), and *laboratory tests not requested* (18.3%) by clinicians. Prescriber acceptance of the pharmacist's recommendations was found to be low (26.8%), suggestive of clinical inertia. Aspirin was found to be irrationally prescribed to patients with DM (15.4%).

Conclusion. Pharmacists can identify, resolve and prevent MTPs and rationalise appropriate medication therapy in patients with DM. Prescriber uptake of pharmacists' pharmacotherapeutic recommendations seems overlooked. Pharmacist-led workshops to advocate for rational prescribing are needed to mitigate MTPs among stable patients with type 2 DM at public sector healthcare facilities.

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Diabetes mellitus (DM) is identified as one of the most challenging public health concerns.[1] In 2019, there were an estimated 463 million adults with DM worldwide and 19.4 million in Africa.[2] In South Africa (SA), the age-adjusted comparative prevalence of DM was 12.7% in 2019, and 23% of the health budget was spent on diabetes care,[2] imposing an economic burden on the country's fragmented health system.[3,4] A Cape Town study (2008) further reported a high prevalence (28.2%) of type 2 DM.[5]

DM forms part of SA's quadruple burden of disease[6] that requires comprehensive management at a primary care level. Despite evidence demonstrating the benefits of attaining glycaemic control, management of this disease is still largely lacking. Glycaemic targets are not being met, which can lead to diabetic complications.[7] Suboptimal management of patients with DM at primary healthcare (PHC) level can be attributed to lack of prescriber adherence to guidelines and failure to draw blood samples for laboratory testing, while recording of the body mass index (BMI) is often overlooked.[8] In Tshwane district, findings from a review of patient folders noted limited recordings of glycated haemoglobin (HbA1c), a lipogram or total cholesterol test result, and kidney function with a serum creatinine level.[9]

In addition, patients with type 2 DM often present with comorbidities[10,11] and receive multiple medications which could lead to medication therapy problems (MTPs) that interfere with desired therapeutic outcomes.[12] MTPs may include wrong choice of medicine, incorrect dosage, medicine-disease interactions, adherence problems,[13] polypharmacy, and dosage adjustment in renal failure.[10] Through their extensive training in medication therapy,[14] pharmacists are ideally suited to interpret the patient's physical, clinical and laboratory data relative to therapeutic guidelines to assess the effectiveness and safety of each individual patient's medicine regimen and offer recommendations to prescribers[12] to optimise diabetes management at the PHC level.

An Ethiopian pharmacist-led intervention study for patients with type 2 DM further identified MTPs such as additional therapy, ineffective therapy, very low dosages and limited prescribing of a

statin.[15] Elsewhere, studies have also demonstrated that pharmacists have identified and prevented such problems and have made recommendations to clinicians, who either acknowledged and acted on the recommendation or rejected the pharmacist's recommendation to resolve the MTP.[16-18] Such medication therapy interventions in adult patients with type 2 DM led to an improvement in HbA1c, lipid profile and BMI and a decrease in fasting plasma glucose and blood pressure,[19] and were found to save costs for the health system.[20]

While numerous pharmacist intervention studies are conducted in hospital settings, pharmacist-led medication therapy management (MTM) interventions among stable diabetes club patients at a community day centre (CDC) in Cape Town have not yet been documented. A multidisciplinary team can offer regular and comprehensive therapeutic assessments of clinical, biochemical and physical parameters to minimise the risk of developing long-term complications of DM.[21] Rational prescribing is achieved when prescribers adhere to the standard treatment guidelines (STGs), Essential Medicines List (EML)[22] and updated pharmacotherapeutic approaches[8,23] to optimise medication therapy and health outcomes among patients with DM.[21]

Objectives

This study aimed to audit the implementation of a pharmacist-led MTM intervention to optimise the management of stable patients with type 2 DM.

Methods

Study design

An evaluation design using a case study approach was undertaken at a single CDC. A non-invasive technique was designed to follow the CDC's routine operational procedures, including those involving prescribers.

Setting

The study was conducted in a subdistrict of Cape Town. The CDC has a functional 'club' system[24] whereby patients with DM who adhere to their medicine regimen and have minimal changes in their clinical status (classified as stable)[25] are referred to the club, to which they return every 6 months for their follow-up appointment. The first issue of medication is dispensed at the facility's pharmacy. Thereafter, patients collect their repeat medication through the chronic dispensing unit (CDU) at a decentralised pick-up point (off site) located closest to the community.[26]

The CDC offers chronic care for diseases such as diabetes, hypertension, epilepsy and asthma on specific club days. Forty appointments for stable patients are reserved for the Thursday diabetes club per week (~160 per month). 'Stable' diabetes club patients are seen by either the club doctor or a clinical nurse practitioner (CNP) and their appointment dates are recorded in a club register. The CNP refers patients to the doctors when assessment of their clinical data shows them to be poorly controlled. Such patients are identified as 'unstable'.

The club system was introduced to improve patient flow and reduce the workload and waiting times at the CDC. The organisational flow of this facility's club system is outlined in Fig. 1. A reception clerk is assigned to have the club patient folders pre-drawn a day before the club appointment date, to fast-track folder access for the club patients for the next day (1). On the club day, a staff nurse records physical (weight and height) and clinical (blood pressure, fasting plasma glucose and dipstick urinalysis) measurements in the folder (2). At this facility, the staff nurse is expected to measure and record the patient's height and weight, and the prescribers to calculate and record the BMI. A health promoter offers health talks to educate the club patients about lifestyle changes (A). The patient's blood sample is taken for laboratory tests (blood lipid panel, HbA1c, serum creatinine) 2 weeks prior to their club appointment (B). Patient laboratory test results are obtained within 3 days, depending on resource availability (network points, computers, printers) at the CDC. The club doctor or CNP examines the patient, reviews laboratory test results, and prescribes the patient's chronic medication during the consultation (3). Prescriptions are written up for a period of 6 months and club patients only receive their initial 1-month supply of chronic medication from the pharmacy (4). For the next 5 months, until the 6-month follow-up club appointment, stable patients are required to collect their chronic medication at the CDU off site (C).

Study participants

The target population included stable patients with type 2 DM who attended the diabetes club and the facility staff who managed those patients. The research pharmacist (FS) collected data via a folder review and did not have face-to-face contact with patients. Inclusion criteria for folder review included adult patients (>18 years) diagnosed with type 2 DM, categorised as 'stable' and attending the diabetes club, and with a valid 6-month prescription. Patients attending other chronic disease clubs or diagnosed with type 1 DM were excluded for folder review, as the focus of the study was adult type 2 DM owing to the high prevalence of the condition in Cape Town.[5]

Prescribing staff who managed the club patients and consented to participate in the study were recruited. They consisted of 2 doctors and 2 CNPs. The doctors had a medical bachelor's degree with <10 years of experience, whereas the CNPs had a diploma in clinical nursing science, health assessment, treatment and care, with >10 years of experience.

Sample method and size

Non-probability convenience sampling was used. The minimum number of stable diabetes club patient folders required for review was calculated using the formula:[27] $n = z^2p(1-p)/d^2$ (n=100); z = 1.96 for 95% confidence level, d = 0.05, and the prevalence of DM in the population was assumed to be 7%. To accommodate for missing or incomplete data, the sample size was increased by 10%, so a minimum of 110 folders were required for review.

Data collection tools and process

The pharmacist's MTM data tools were a patient data extraction sheet, an intervention log sheet, an assessment worksheet, an intervention label, and a reminder prompt cover page that was mounted on the patient folder (Appendix 1, https://www.samedical.org/file/1828).

The researcher, a pharmacist trained in pharmacotherapeutics, attended a 1-year course, 'Integrated applied therapeutics: Fundamentals of rational prescribing' (2015), offered by Pharmacy Education International, an approved South African Pharmacy Council provider.[28] One of the key competencies was MTM for non-communicable diseases using the PHC STGs and EML.

The researcher used the pharmacotherapy work-up notes to categorise the MTPs (n=8) and their types (n=35),[12] using the PHC STGs and EML (2014) and government circular H141/2017[29,30] to audit each folder. A list of MTP categories and types is provided in Appendix 1. Guidelines used in practice generally consist of the Society for Endocrinology, Metabolism and Diabetes of South Africa (SEMDSA) guidelines.[31] The STGs for the management of DM are synthesised from the SEMDSA guidelines in the public sector. In this study, STGs therefore serve as a key reference to audit diabetes patient

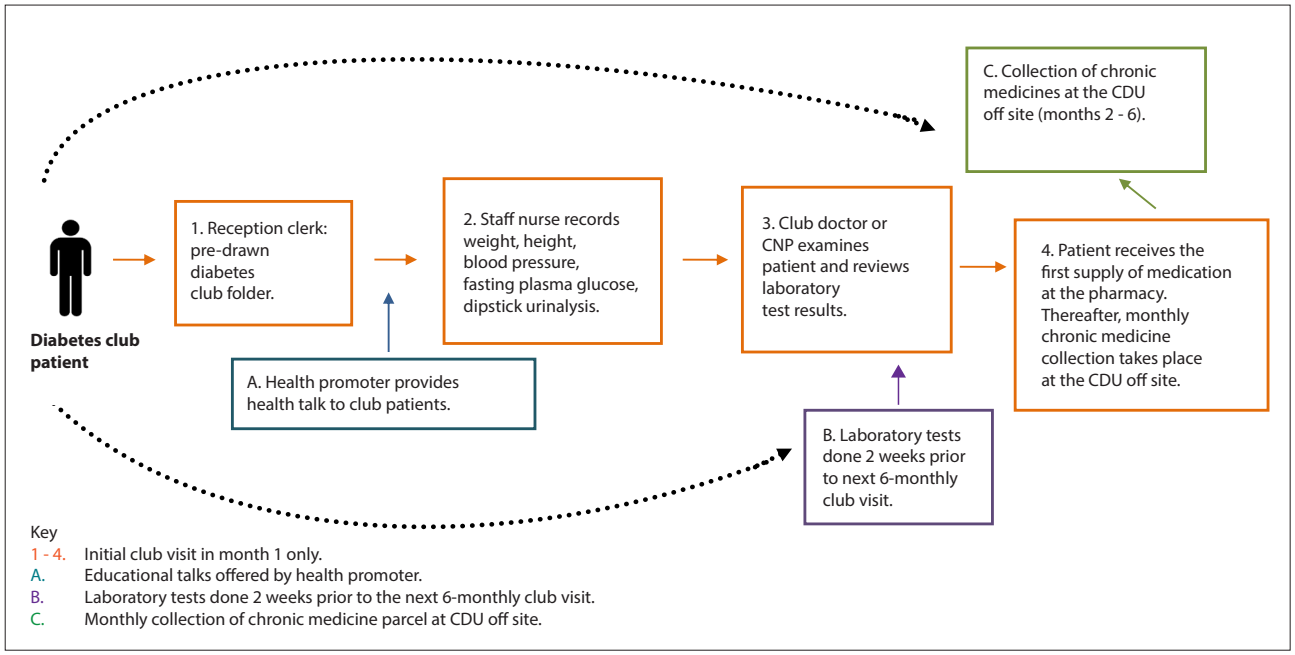

Fig. 1. Twice-yearly club visit for stable patients with diabetes mellitus, and subsequent monthly medicine collection at the CDU off site. (CNP = clinical nurse practitioner; CDU = chronic dispensing unit.)

folders.[29] The Practical Approach to Care Kit (PACK) Primary Care Guide for the Adult,[32] formerly known as Primary Care 101,[33] is a clinical decision support tool designed for use by a clinician, tailored for low-income, extremely resource-constrained primary care settings with a high patient burden. The PACK uses a symptom-based approach and a standardised approach to the routine care of patients with chronic condition(s).[32] Clinicians are advised to use the PACK in conjunction with the latest edition of the PHC STGs and EML.[32] Even though PACK guidelines are used in clinics, the latest edition of the EML takes precedence when differences in treatment guideline recommendations exist.[34]

The data collection process was phased (Appendix 2, https://www.samedical.org/file/1828) to accommodate the clinic's routine diabetes club workflow (described earlier). The pharmacist's pharmacotherapeutic intervention was performed 1 week prior to the patient's club appointment date to enable prescribers to respond to the written pharmacist recommendations.

The research pharmacist obtained permission from the CNP to acquire the patient list from the club register to access diabetes patient folders from the reception department on a weekly basis. At phase 1, a 2-week pilot study was conducted prospectively. Patient folders (n=7) that met the criteria were audited to test the pharmacist's MTM data tools and make amendments, and those folders were excluded from the main study, which was conducted over 8 months (November 2016 - June 2017).

The folders of stable patients with type 2 DM were randomly selected for audit, retrospectively. At phase 2, *baseline information* (demographics, comorbidities, and physical, clinical and biochemical parameters) was recorded on a predesigned patient data sheet. Owing to workload constraints, folder audits were performed by the research pharmacist before the patient's Thursday club appointment date. The pharmacist-led MTM intervention was dependent on the availability of the blood results that were meant to be taken 2 weeks prior to the club appointment. During phase 3, the intervention phase, the pharmacist *logged MTM interventions* and pharmacotherapeutic recommendation(s) for the prescribers' attention, on a log sheet, based on the information in the file and the latest blood results recorded for the patient. The research pharmacist only undertook one round of pharmacist-led interventions. A cover sheet was mounted on the front of the patient folder, intended to alert prescribers to an intervention label containing the pharmacist's recommendation, which was attached to the existing prescription inside the folder. The pharmacist's recommendations were offered before the patient returned for their follow-up appointment at the diabetes club within 6 months after their previous appointment. After the club visit, the pharmacist retrieved the folders from the reception department and continued to audit the folders retrospectively for the prescribers' response. Prescriber responses to the pharmacist's recommendations were noted at phase 4, *post-intervention*, as 'accepted' (had been agreed to and noted accordingly onto the prescription), 'partially accepted' (not completely rejected) or 'rejected' (not accepted) on the pharmacist's assessment worksheet. At phase 5, the patient's *6-month follow-up*, physical and laboratory data (HbA1c, total cholesterol, serum creatinine) were re-assessed and audited. Data were compared with *baseline* and *post-intervention* data. A comparison of cost estimates between rational and irrational prescribing of aspirin was calculated for 28 days over a 6-month expenditure period: tender price ZAR5.38 for a single (14s) pack unit (Western Cape Master Procurement Catalogue, November 2016).

Ethical considerations

Ethics approval was obtained from the University of the Western Cape Biomedical Research Ethics Committee (ref. no. BM/16/4/11) and the Western Cape Department of Health (ref. no. WC_2016RP43_75). Facility staff was informed of the study before it began. Written informed consent was obtained from the prescribing staff members who agreed to participate in the study.

Statistical analysis

Data collected were captured into an Excel 2007 spreadsheet (Microsoft, USA), and SPSS statistics software, version 24 (IBM, USA), was used to analyse the data, which consisted of descriptive and inferential statistics. The means, standard deviations (SDs), and minimum and maximum figures for the patients' baseline

characteristics were calculated. In an inferential approach, data were analysed using means, standard errors and 95% confidence intervals. Statistical significance was considered at $p<0.05$. Prescriber responses to the pharmacist's intervention were included in the data analysis. A paired-sample *t*-test was applied to compare data obtained from folders of stable patients at baseline (pre-intervention), at prescriber response to pharmacist-led intervention (post-intervention), and at 6-month club follow-up. Pre-prescriber practice and post-prescriber response were compared following the pharmacist's recommendations. No statistically significant correlations between the pharmacist's intervention and any of the clinical parameters and laboratory tests were found when using the paired-sample *t*-test, consequently resulting in no conclusive findings.

Results

Study sample demographic data and clinical characteristics

A total of 104 patient folders were included in the study. The mean (SD) age of the patients was 57.7 (9.2) years, and 67.3% of them were female. There was a mean of 3.1 (0.9) chronic illnesses per patient, and the mean BMI was 31.6 (7.2) kg/m^2, indicating overweight or moderately obese patients. Blood pressure was recorded for all patients (100%) and fasting plasma glucose in 99.0%. Table 1 presents the demographic and clinical indicators for the study sample.

At baseline, only 43 patients (2015) and 54 patients (2016) had their HbA1c levels checked. The mean (SD) HbA1c in 2015 was 8.6% (1.8%) and in 2016 it was 8.5% (1.9%). Optimal glycaemic control (HbA1c <7%) was only achieved in 8.6% (2015) and 11.5% (2016) of patients. Laboratory tests performed by healthcare staff are shown in Table 2.

Table 3 documents the pharmacological treatment prescribed for stable patients with type 2 diabetes at baseline. Almost all patients were prescribed metformin (89.4%), either as monotherapy or in combination, a statin (86.5%) and aspirin (79.8%).The most commonly prescribed antihypertensive medicine groups were angiotensin-converting enzyme inhibitors (62.5%) and calcium channel blockers (62.5%), followed by thiazide diuretics, loop diuretics and beta-blockers.

MTPs identified and prescribers' response to the pharmacist's recommendations

MTP types that were identified and prescriber responses to the pharmacist's recommendations are outlined in Table 4. There was a total of 453 interventions, an average of 4 per patient. At post-intervention, the highest number of MTPs identified were *BMI not documented* (*n*=102; 22.5%), *no medical indication noted* (*n*=87; 19.2%) for a prescribed medicine, and *laboratory tests not requested* (*n*=83; 18.3%). Laboratory tests that were absent at baseline (2015 and 2016) were HbA1c, total cholesterol and serum creatinine (Table 2).

Overall, prescribers rejected more than two-thirds (*n*=314; 69.7%) and accepted a quarter (*n*=123; 26.8%) of the pharmacist-led interventions (Table 4).

Of the 102 interventions for *BMI not documented*, doctors rejected 47 and CNPs 36 pharmacist's recommendations. Rejection of the pharmacist's recommendations for the MTP *laboratory tests not requested* was two-fold higher among the doctors (*n*=38; 8.4%) compared with the CNPs (*n*=19; 4.2%). Doctors and CNPs showed similar rejection trends for the pharmacist's recommendation relating to the MTPs *no medical indication noted* (*n*=31; 6.9% and *n*=28; 6.2%, respectively), *synergistic/potentiating effects of medicines* (*n*=23; 5.1% and *n*=26; 5.7%, respectively), and *inappropriate (low and high) dosage* (*n*=25; 5.6% and *n*=22; 4.8%, respectively).

The label seemed to have had negligible influence on prescriber behaviour change.

Estimated expenditure associated with irrational prescribing of aspirin

Although the majority of MTPs were identified as *BMI not documented*, the MTP type *no medical indication noted* (*n*=87) was the second most common MTP that attracted attention during the pharmacist intervention study. The prescribed medicine that emerged as a particular concern for the research pharmacist during the study was aspirin. Of the 87 pharmacist-led interventions for the MTP *no medical indication noted*, 70 (15.4%) were directly related to irrational prescribing of aspirin (Table 5). Prescriber rejection of pharmacist-led recommendations for aspirin led to over three-fold expenditure estimates for 28-day (ZAR196.37) and 6-month (ZAR1 178.22) supplies, when compared with prescriber acceptance of the pharmacist's recommendation (ZAR53.80 and ZAR322.80, respectively) (Western Cape Master Procurement Catalogue, November 2016).

Discussion

Overall findings from the pharmacist-led interventions illustrate that diabetes management at the primary care facility is suboptimal. The mean HbA1c (2015) in this study was 8.6%. Figures were similar in studies in the Tshwane district[9] and Cape Town,[35] both reporting a mean HbA1c of 8.8%, which exceeds the 7% target[36] and indicates that diabetes is suboptimally managed and that current practice interventions are not effective.

Our exploratory study attempted to implement 'pharmacist-led' MTM interventions to determine the effectiveness of prescribed medication therapy in the management of stable patients with type 2 diabetes attending a diabetes club for routine care at the CDC. The pharmacist recommendations were made according to evidence-based STGs. In this study, there was an average of 4 interventions per patient, which is similar to the number in a study in Denmark[37] but two times higher than that recorded in a Malaysian study.[11] The MTP categories and types listed in our study were framed on the Pharmacotherapy Workup Notes,[12] while other researchers have used the Problem Intervention Documentation coding system[37] and the Pharmaceutical Network Care Europe tool version 5.01.[38] Variation in MTP instrument framework and the country-specific reference guidelines being used would offer different outcomes on prescription reviews.

The most common MTP types documented by the pharmacist were *BMI not documented* (*n*=102; 22.5%), *no medical indication noted* (*n*=87; 19.2%) and *laboratory tests not requested* (*n*=83; 18.3%).

The BMI in a patient with DM is a cornerstone of therapeutic efficacy monitoring and subsequent decision-making, as it assesses obesity status and cardiovascular risk factors.[39] A deteriorating BMI impedes treatment efficacy because lifestyle interventions are not adequate.[40] Since the staff nurse is expected to measure and record the patient's height and weight, it is the prescriber's responsibility to calculate and record the patient's BMI in the folder at each clinical visit.[39]

The most prominent medicine that was prescribed without an indication was aspirin, which underscores poor prescriber adherence to evidence-based guidelines. As per guidelines, low-dose aspirin is only indicated in the secondary prophylaxis for cardiovascular disease, requiring a diagnosis of myocardial infarction, cerebrovascular accident, ischaemic heart disease or peripheral vascular disease to be noted in the folder to make its use rational. Although the pharmacist-led recommendations had alerted prescribers to consider removing aspirin from the patients' regimen, almost three-quarters (*n*=53;

Table 1. Baseline characteristics of stable patients with type 2 DM (*N*=104)

Variable	
Gender (*N*=104), *n* (%)	
Male	34 (32.7)
Female	70 (67.3)
Age (years) (*N*=104)	
Patients, *n* (%)	
21 - 30	1 (1)
31 - 40	3 (2.9)
41 - 50	18 (17.3)
51 - 60	38 (36.5)
61 - 70	39 (37.5)
71 - 80	5 (4.8)
Mean (SD)	57.7 (9.2)
Range	26 - 80
Medicine allergies (*N*=104), *n* (%)	
Known*	10 (9.6)
Not known	94 (90.4)
DM only or with comorbidity/ies (*N*=104)	
Patients, *n* (%)	
DM only	2 (1.9)
DM, hypertension, others†	30 (28.8)
DM, hypertension, hypercholesterolaemia, others	27 (26.0)
DM, hypertension	22 (21.2)
DM, hypertension, hypercholesterolaemia	16 (15.4)
DM, others	3 (2.9)
DM, hypercholesterolaemia	2 (1.9)
DM, hypercholesterolaemia, others	2 (1.9)
Number of chronic diseases per patient, mean (SD)	3.1 (0.9)
Height (m) (*N*=102)	
Mean (SD)	1.6 (0.1)
Range	1.45 - 1.84
Weight (kg) (*N*=102)	
Mean (SD)	82.2 (18.5)
Range	52 - 148
BMI (kg/m^2) (*N*=94)	
Patients, *n* (%)	
18.5 - 24.9 (normal)	9 (8.7)
25.0 - 29.9 (overweight)	37 (35.6)
30.0 - 34.9 (mildly obese)	25 (24.0)
35.0 - 39.9 (moderately obese)	10 (9.6)
>40 (extremely obese)	13 (12.5)
Mean (SD)	31.6 (7.2)
Range	18.5 - 55
Systolic blood pressure (mmHg) (*N*=104)	
Patients, *n* (%)	
>140	58 (55.8)
<140	46 (44.2)
Mean (SD)	144 (19.0)
Range	100 - 187
Diastolic blood pressure (mmHg) (*N*=104)	
Patients, *n* (%)	
>90	18 (17.3)
<90	86 (82.7)
Mean (SD)	82.8 (9.9)
Range	47 - 108

Continued ...

Table 1. (continued) Baseline characteristics of stable patients with type 2 DM (*N*=104)

Variable	
Fasting plasma glucose (mmol/L) (*N*=103)	
Mean	8.2 (3.1)
Range	2 - 16.6
Patients, *n* (%)	
<8 (acceptable)	51 (49.0)
Mean (SD)	5.7 (1.5)
Range	2 - 7.9
>8 (uncontrolled)	52 (50.0)
Mean (SD)	10.7 (2.2)
Range	8 - 16.6
eGFR (mL/min/1.73 m^2)	
2015 (*N*=43)	
Patients, *n* (%)	
>90 (normal)	34 (32.7)
60 - 89 (mild)	4 (3.8)
30 - 59 (moderate)	5 (4.8)
15 - 29 (severe)	0
Mean (SD)	131.0 (67.0)
Range	31 - 353
2016 (*N*=58)	
Patients, *n* (%)	
>90 (normal)	41 (39.4)
60 - 89 (mild)	12 (11.5)
30 - 59 (moderate)	5 (4.8)
15 - 29 (severe)	0
Mean (SD)	131.0 (67.0)
Range	32 - 386

DM = diabetes mellitus; SD = standard deviation; BMI = body mass index; eGFR = estimated glomerular filtration rate.
*Medicine-induced allergies: enalapril, metformin, glimepiride, penicillin, co-trimoxazole, aspirin.
†Others: osteoarthritis, chronic obstructive pulmonary disease, ischaemic heart disease, gout.

Table 2. Laboratory tests performed by healthcare staff (*N*=104 patients)

	Year	
Laboratory test	**2015**	**2016**
HbA1c (%)		
Patients, *n** (%)	43 (41.3)	54 (51.9)
<7 (optimal)	9 (8.6)	12 (11.5)
7 - 8 (acceptable)	6 (5.8)	12 (11.5)
>8 (uncontrolled)	28 (26.9)	30 (28.9)
Mean (SD)	8.6 (1.8)	8.5 (1.9)
Range	5.7 - 14.2	5.5 - 12.8
Total cholesterol (mmol/L)		
Patients, *n** (%)	44 (42.3)	54 (51.9)
<4.5	27 (26.0)	23 (22.1)
>4.5	17 (16.3)	31 (29.8)
Mean (SD)	4.3 (0.9)	4.7 (1.1)
Range	2.67 - 6.71	2.58 - 8.69
Serum creatinine (μmol/L)		
Patients, *n** (%)	43 (41.4)	58 (55.7)
<49	6 (5.8)	13 (12.5)
49 - 90	31 (29.8)	39 (37.4)
>90	6 (5.8)	6 (5.8)
Mean (SD)	68.8 (27.2)	67.0 (25.6)
Range	40 - 145	34 - 172

HbA1c = glycated haemoglobin; SD = standard deviation.
*Number of patients who had test performed with treatment targets at baseline.

75.7%) were rejected (Table 5), indicating poor prescriber adherence to the government circular on aspirin.[30] Inappropriate prescribing of aspirin was also addressed in an Italian study that reported lower findings of only 2.6% of cases where there was no reason for aspirin use,[41] whereas our study reported 15.4% of cases with no medical indication noted for aspirin use.

Other SA studies have also noted the absence of laboratory testing,[42,43] which particularly impedes the pharmacist's ability to determine whether the prescribed treatment is effective and safe for the patient. In addition, the absence of a co-ordinated system to track, review and file laboratory test data underpins a poor medical record-keeping system.[44]

Table 3. Baseline treatment (pharmacological groups) of the study sample (*N*=104)

Medication treatment	Patients, *n* (%)
Antidiabetic groups	
Biguanide (metformin oral)	93 (89.4)
Sulphonylurea (glimepiride oral)	45 (43.3)
Insulin	38 (36.5)
Number of antidiabetics prescribed	
1 oral medicine only	33 (31.7)
2 oral medicines	32 (30.8)
Insulin and 1 oral medicine	27 (26.0)
Insulin and 2 oral medicines	7 (6.7)
Insulin only	7 (6.7)
Antihypertensive groups	
Angiotensin-converting enzyme inhibitor	65 (62.5)
Calcium channel blocker	65 (62.5)
Thiazide diuretic	56 (53.8)
Loop diuretic	27 (26.0)
Beta-blocker	25 (24.0)
Number of antihypertensives co-prescribed	
1	10 (9.6)
2	32 (30.8)
3	43 (41.3)
4	10 (9.6)
Statin (simvastatin)	90 (86.5)
Aspirin	83 (79.8)
Other medicines	69 (66.3)

Prescriber acceptance in this study was low (about a third of interventions were accepted). A possible reason for low prescriber acceptance of pharmacist-led interventions in this study may be clinical inertia.[45] Clinical inertia is the failure to set glycaemic targets, and implement and escalate treatment to achieve these therapeutic goals.[46] The cause of clinical inertia is multifactorial, involving patient, physician and health system factors, which explains the poor glycaemic control in SA. Physicians tend to work in isolation, especially at PHC facilities.[45] A 1-year retrospective audit review in KwaZulu-Natal Province found that the poor control and management of patients with type 2 DM at public sector facilities could be attributed to clinical inertia.[46] In the present study, it was thought that clinical inertia could be due to a high workload in the PHC setting, limited prescribing staff, and time constraints. A Cape Town study conducted an appreciative inquiry at 15 community health centres and reported that staff had to deal with a high patient workload, reducing the consultation time for individual patients and resulting in poor quality of care.[47] The high patient load and time constraints at public sector healthcare facilities therefore requires a multidisciplinary approach to converge the scope of practice among facility staff to optimise diabetes management.

Pharmacists in the public sector traditionally operate as mechanical dispensers in outpatient public health facilities, with minimal focus on MTM and clinical interaction with prescribing staff.[48] To optimally manage diabetes at PHC club level, staff roles and responsibilities in multidisciplinary teams should therefore be clearly delineated to ensure that patient data (weight, BMI, blood pressure, laboratory investigations) are noted in the file.[4]

It was noted that costs could potentially be saved by acceptance of a pharmacist-led aspirin intervention, and the fact that an estimated massive three-fold loss was incurred as a result of irrational

Table 5. Prescriber acceptance and rejection of pharmacist-led recommendations for aspirin

	Pharmacist-led recommendations, *n* (%)	
	Accepted	Rejected
Doctors (*N*=2)	11 (15.7)	27 (38.6)
CNPs (*N*=2)	6 (8.6)	26 (37.1)

CNP = clinical nurse practitioner.

Table 4. Summary of MTPs identified, number of pharmacist-led interventions and prescribers' response to the pharmacist's recommendations

		Doctors (*N*=2), *n* (%)			CNPs (*N*=2), *n* (%)		
Description of MTP types	Interventions (*N*=453), *n* (%)	Accepted	Partially accepted	Rejected	Accepted	Partially accepted	Rejected
BMI not documented	102 (22.5)	7 (1.5)	1 (0.2)	47 (10.4)	11 (2.4)	0	36 (8.0)
No medical indication noted	87 (19.2)	16 (3.5)	0	31 (6.9)	12 (2.6)	0	28 (6.2)
Laboratory tests not requested	83 (18.3)	7 (1.5)	0	38 (8.4)	19 (4.2)	0	19 (4.2)
Synergistic/potentiating effects of medicines	64 (14.1)	9 (2.0)	1 (0.2)	23 (5.1)	4 (0.9)	1 (0.2)	26 (5.7)
Dosage too low	43 (9.5)	6 (1.3)	3 (0.7)	11 (2.5)	9 (2.0)	2 (0.4)	12 (2.6)
Dosage too high	36 (7.9)	6 (1.3)	1 (0.2)	14 (3.1)	1 (0.2)	4 (0.9)	10 (2.2)
Untreated medical condition	17 (3.8)	6 (1.3)	0	3 (0.7)	2 (0.4)	1 (0.2)	5 (1.2)
Lack of prophylactic agent	12 (2.6)	2 (0.4)	0	2 (0.4)	4 (0.9)	0	4 (0.9)
Contraindications	5 (1.1)	1 (0.2)	1 (0.2)	2 (0.5)	0	1 (0.2)	0
Medicine interaction	3 (0.7)	1 (0.2)	0	2 (0.5)	0	0	0
Total interventions	453 (100)	61 (13.2)	7 (1.5)	173 (38.5)	62 (13.6)	9 (2)	141 (31.2)

MTP = medication therapy problem; CNP = clinical nurse practitioner; BMI = body mass index.

prescribing is a concern, especially for a constrained health system. Findings from another Cape Town district-based study found that increasing costs were attributed to the number of comorbidities, and that prescribing patterns for DM and hypertension, in relation to the PHC STGs and EML, should be assessed.[3]

MTM provides trained pharmacists with an opportunity to manage patients with chronic diseases, and evaluate and address MTPs through pharmacist-led interventions that have demonstrated both positive clinical and positive economic outcomes.[12]

With most patients with type 2 DM attending public sector primary care facilities rather than hospitals,[49] the findings of the present study indicate that pharmacist-led interventions using evidence-based guidelines can assist a multidisciplinary team in identifying, intervening and preventing MTPs and thus delaying the onset of complications. Furthermore, the pharmacist's responsibility in MTM is key when evaluating physical, clinical and biochemical data to help make timeous adjustments to the patient's medication therapy.

While pharmacists are trained in medication therapy,[14] contextual constraints such as a high patient load, inadequate staff, patients not utilising the clinic system as intended, and an increasing administrative load in public sector facilities precludes them from offering such a practice.[50] In essence, effective task-shifting of the pharmacist's administrative load is required to redefine the role of the pharmacist as an integral member of the PHC team,[50] that depends on patient acceptance, professional dedication, interprofessional collaboration, and funding an appropriate legislative framework.[51]

This study demonstrates the potential role of pharmacists to intervene and promote rational prescribing of medicine at a PHC level in Cape Town.

Study limitations

Data were collected at only one PHC facility, and the study findings therefore lack generalisability. The absence of a control group and the lack of an independent review of the pharmacist's intervention to make comparative assessments do not enable conclusive findings. Owing to the small sample size of the prescribers (n=4) who participated in the pharmacist-led intervention, conclusions regarding prescriber uptake of the intervention cannot be based on the responses of the prescribers, despite the fact that the patient folder sample and number of responses were adequate. The study can therefore only be regarded as an audit of pharmacist-identified prescriber practices in the population of 104 stable patients with type 2 DM (compared with evidence-based STGs for the management of these patients).

Conclusions and recommendations

The study findings demonstrate continued poor management of type 2 DM in primary care and the potential role of a trained pharmacist to evaluate the MTM of chronic stable patients. It also indicates irrational prescribing of aspirin, which begs the question: how effectively are government circulars and guideline updates being disseminated among healthcare personnel at facility level? Regular facility-based pharmacist-led workshops could promote rational prescribing by advocating for the provision of pharmaceutical care in primary care and policy through task-shifting. The next step is to replicate the pharmacist-led MTM study in other CDCs located in the same subdistrict.

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