

COST-EFFECTIVE CONTROL OF COMMON CHRONIC DISEASES

Summary

The cost and effectiveness of treating hypertension and diabetes at three out-patient clinics in a provincial state-funded hospital in Johannesburg, South Africa were compared so that recommendations for the care of these patients and of those suffering from other common chronic non-communicable diseases such as asthma and epilepsy could be made. Thirty-five percent of out-patient dispensary prescriptions were for drugs used to treat hypertension and diabetes. These four diseases and their complications accounted for 63% of conditions seen at the three clinics.

The three clinics differed from each other. At the clinic [special] which served only hypertensives and diabetics in-service trained nurses acted as clinical clerks. Structured clinical records, criteria for diagnosis and organisational and clinical protocols were used. Non-pharmacological measures were stressed. The clinic doctor acted as a clinical consultant, teacher and coordinator. Continuity of care was practiced and regular audits, a participatory philosophy and patient empowerment were attempted.

The second clinic was a conventional medical out-patients' department [MOPD] serving patients suffering from severe or complicated medical conditions. Hypertensives and diabetics constituted 56% of the patient load. The third clinic [polyclinic] resembled a general practice. Among the patients attending this clinic were 38% with uncomplicated mild or moderate hypertension and non-insulin dependent uncomplicated diabetics. Together MOPD and polyclinic saw a spectrum of hypertensive and diabetic disease similar to that at the special clinic with which they are compared. At these two clinics patients were conventionally managed by doctors.

The study samples comprised all the patients and staff at the three clinics, randomly selected samples of patients to whom drugs for the treatment of hypertension and

diabetes had been issued during 1 week in October 1985, and all in-patients suffering from hypertension and diabetes during a 24-hour period in the same week.

Patients with hypertension and diabetes attending the special clinic were as well controlled as, and with possibly less need for in-patient care than, the patients at MOPD and polyclinic. 88% of patients at the special clinic attended punctually while only 52% did so at MOPD. The cost/patient for drugs to treat hypertension and for tests tended to be lower in the special clinic than at the other two clinics. The cost of staff was higher but could be reduced without loss in the quality of the service. Staff costs at polyclinic were relatively low but clinicians spent less than 10 minutes per patient.

It was concluded that a dedicated clinic similar to the special clinic, employing in-service trained non-registered nurses and lay health workers as clinical clerks, a nurse-practitioner to attend to intercurrent ailments and a registered nurse-administrator, supported by a doctor, could serve as a model for a medical service which could cost-effectively care for patients suffering from common chronic non-communicable diseases.

Introduction

It is logistically and economically not possible even in affluent societies to manage the large number of people suffering from common chronic diseases using current methods. The impact on health sector costs, the economy of a country and personal budgets attributable to the morbidity and mortality associated with these diseases is very large. The high cost of ambulatory management of these diseases and their complications is compounded by expensive radiological and laboratory investigations, high-tech emergency and in-patient care, and by sophisticated and time-consuming rehabilitation programmes.

The objective of the reported survey was to facilitate the planning of a cost-effective out-patient medical service for the control of chronic diseases such as obesity, the community syndrome of hypertension, atherosclerosis and diabetes [CHAD]¹, asthma, non-rheumatoid musculo-skeletal disorders, and epilepsy.

The organisational structure, cost and effectiveness of an experimental hypertension and diabetes hospital-based clinic was investigated. This clinic was compared with two conventional out-patient clinics in the same hospital where hypertensives and diabetics were also managed. It was assumed that the findings could be extrapolated to the management of other common chronic conditions.

Routinely collected data were used. Research variables in health systems research are often difficult to determine and control for, and the findings may arouse controversy.² This also applied here.

Control can be equated to disease-containment with minimal disruption of the activities of daily living while maintaining a reasonable quality of life. In comparison with other interventions a cost-effective intervention should have a better outcome while costing less, or at least the same, or have the same outcome while costing less. Cost-effective control of chronic disease therefore simplistically refers to a relatively good outcome, which is achieved relatively cheaply.

Subjects and methods

Study design

This was a cross-sectional survey. It was conducted at Hillbrow Hospital, a public-sector academic institution in central Johannesburg, South Africa. The hospital had 740 beds and operated a comprehensive out-patient and casualty facility. It served an exclusively black urban population. Hypertensives and diabetics were seen in the hospital out-patients' division at one of three clinics: the experimental clinic called the Hypertension and Diabetes Clinic [HTDMC], the medical out-patients department [MOPD] and a polyclinic.

Samples

All staff working in the three clinics during the last week of October 1985 formed the staff sample. All hypertensives and diabetics who attended the three clinics during

the survey week formed the out-patient index sample. All the patients who attended HTDMC and polyclinic during the month of October 1985 and all the patients who attended MOPD four weeks later made up the sample for defining the pattern of disease among medical out-patients. Tests performed on urine and blood from all the patients in the three clinics were included in the test sample.

Several dispensary samples were used. The folders of all the out-patients served at the dispensary during the survey week formed the out-patient dispensary sample. The folders of all the patients from HTDMC and MOPD and of alternate patients from polyclinic who had been supplied during the survey week with drugs used in the treatment of hypertension and diabetes with numbers commencing with digits 0 through 3 formed the clinic dispensary sample. This sample was also used to assess blood pressure control. The sample for calculating drug costs was selected from the clinic dispensary sample by matching the end digit of the folder numbers with random numbers until 16 folders were obtained from each clinic. All hypertensives and diabetics in hospital during a 24 hour-period during the survey week formed the in-patient sample.

Data collection

The author who worked as the only doctor in HTDMC interviewed key informants at the other two clinics and observed how their services were organised. Data on diagnoses were taken from daily summaries in HTDMC and polyclinic, and that on attendance from lists kept by the administrative clerks. Data on tests were taken from the records of specimen handlers. Other data were extracted from the patients' folders. Costs were calculated per person and per item and then aggregated.

Appointments and repeat prescriptions

All attendances at HTDMC and MOPD were by appointment. Only patients suffering from chronic diseases were given appointments at polyclinic. All patients on medication were expected to attend every four weeks for review or to collect repeat prescriptions. HTDMC patients did not collect repeat prescriptions without being seen. The other patients did.

Punctual attenders, unbooked patients, defaulters and re-admissions

Patients who attended on their appointment day were called punctual attenders, and those who attended without appointments were called unbooked patients. Patients who did not attend within one week of their appointment day or whose repeat prescriptions were more than one week overdue were called defaulters.

Measurement of blood pressure

In HTDMC a nurse used an electronic sphygmomanometer to measure blood pressure on the left arm of a seated patient. Wide cuffs were used on patients with fat arms. The diastolic pressure was read when the sounds disappeared. Only one reading was taken. Doctors using mercury sphygmomanometers measured blood pressure in MOPD and polyclinic. Standardised methods were not used.

Criteria for diagnosis

HTDMC used criteria for the diagnosis of hypertension, diabetes and impaired renal function. The cut-off levels for the diagnosis of hypertension were 160/95 mm Hg present on two consecutive occasions or on two out of three occasions separated by an interval of at least four weeks. The 1980 WHO criteria for the diagnosis of diabetes were used³. The other two clinics did not use any criteria.

Drug doses

Drugs used in the treatment of hypertension and diabetes were counted as one item if prescribed in the doses recommended at HTDMC. These were called standard doses. Examples are shown in table 1. Drugs prescribed in higher doses were counted as multiples of the standard dose.

Table 1 - Standard daily drug doses at HTDMC

drug	dose in mg
hydrochlorothiazide	25
diuretic combination 1	
hydrochlorothiazide	25
amiloride	2.5
diuretic combination 2	
hydrochlorothiazide	25
triamterene	50
furosemide	40
reserpine	0.125
methyldopa	500
atenolol	100
hydralazine	40
glipizide	160
metformin	1700
insulin	40 units

Costs

Only staff, blood and urine tests and drugs were costed. State tender prices were used. Monetary values were converted into comparative units. The lowest hourly staff salary rate was given a value of one when calculating staff costs. The cost of the cheapest test was used as the unit to calculate the cost of tests and drugs.

Salary scales were obtained from the hospital staff office. Because the average salary of the doctors approximated that of a senior medical officer this salary was used for all the doctors. The salary scale of a senior grade nurse was used. There was only one grade of ward helper and the salary of the ordinary grade of clerk was used. In 1985 black African staff was paid less than staff from the other racially-identified South African population groups. Staff costs were therefore calculated using the scales operating after 1989 when racial differentials were abolished.

The cost of disposable test items and of prescribed drugs, drug containers, and drug packaging was obtained from the senior hospital pharmacist. The cost of equipment used for in-house tests was obtained from the suppliers and adjusted for

depreciation. The cost of laboratory investigations and of equipment used for specimen collection was obtained from the laboratory.

Test and dispensary items and labour costs were included in the estimations except in HTDMC where labour costs are excluded because specimens were collected and tests performed by the staff in the course of their other duties.

Results

Staff

In HTDMC the doctor acted as a clinical consultant, teacher, organiser and service co-ordinator. Three registered nurses and one staff nurse worked as clinical clerks, patient educators and social counsellors. During the consultation they also collected and tested blood specimen, endorsed repeat prescriptions and made appointments. One staff nurse ran group and individual patient education programmes, visited HTDMC in-patients, and traced defaulters. She had no other duties. Two enrolled nursing assistants weighed patients, tested and collected urine specimens, interviewed and counselled new patients and entered laboratory results into the patients' clinic-retained records.

The non-medical staff at HTDMC included ward-helpers, administrative clerks, and voluntary workers. The ward helpers were responsible for the retrieval and filing of the clinic-retained folders. They acted as messengers and arranged tea and sandwiches for all patients as well as a light lunch for diabetics. The administrative clerks answered the telephone, entered data and down-loaded appointment and defaulter lists from a private computer linked to a main-frame at the university, and compiled daily clinic attendance figures. They assisted with hospital folder retrieval and fee paying. At the time of the survey there was only one voluntary worker who assisted with the education and exercise programme. There were no interpreters.

Four teams of physicians, medical registrars and interns worked in MOPD. At other times of the year the teams also included final-year medical students. The patients

were haphazardly distributed among the doctors with interns often attending to severely ill patients while physicians saw patients with mild and moderate disease. Four doctors and one nurse practitioner worked in polyclinic. The nurse practitioner did not attend to patients with chronic diseases.

In both MOPD and polyclinic ward-helpers assisted the doctors and acted as interpreters. In MOPD the enrolled nursing assistants helped out generally and also assisted the doctors. In polyclinic the enrolled nursing assistant and the staff nurses weighed patients, tested urine and measured capillary blood glucose. The administrative clerks answered the telephone and compiled appointment lists.

Doctors in HTDMC and polyclinic worked a 40-hour week, nurses and clerks a 45-hour week, and ward helpers a 50-hour week. Staff members were allowed one hour for morning tea and lunch. In HTDMC the same staff members were on duty every day, but the staff composition varied from day to day in the other two clinics. The daily staff complement in the three clinics during the survey week is shown in table 2. The average daily number of hours worked in the clinics is shown in table 3.

Table 2 - Average daily staff complement defined by staff qualifications

qualification	HTDMC	MOPD	polyclinic
doctor	1	7	3
primary health care nurse	0	0	1
registered nurse	3	1	2
staff nurse	2	0	2
enrolled nursing assistant	2	4	1
ward helper	1	5	6
administrative clerk	2	2	2
total	11	19	17

In MOPD and polyclinic data on patient load, duration of consultation, and cost per patient could not be obtained separately for hypertensives and diabetics. The findings for the three clinics are shown in tables 4 and 5.

Table 3 - Daily use of time in the three clinics

	HTDMC	MOPD	polyclinic
hours on duty per formal qualification			
doctors	8	21	24
primary health care nurse	0	0	9
registered nurses	27	9	18
staff nurses	18	0	18
enrolled nursing assistants	18	36	9
ward helpers	10	50	60
administrative clerks	18	18	18
hours on duty per job description			
doctors and primary health care nurse	8	21	33
clinical clerks	36	0	0
other nursing staff	27	45	45
administrative and general staff	28	68	78
hours not spent on patient care			
at tea and lunch	11	12	17
on administration and cleaning	5	12	0
number of hours with no patients in clinic	5	37	0
number of hours with no doctors in clinic	0	65	0
number of hours with nothing to do *	0	25	0
% unproductive time	0	20	0

* excluding time spent at tea and lunch

Table 4 - Number of patients seen per hour and time spent per patient

	total (n = 339)	HTDMC old patients (n = 291)	MOPD all patients (n = 385)	polyclinic all patients (n = 912)
average number of patients seen per hour				
doctor	9.69	10.39	4.53	6.25
doctor + primary health care nurse				6.25
clinical clerk	2.12	2.27		
administrative clerk	4.52		7.40	11.40
calculated number of minutes spent with one patient				
doctor	6.19	5.77	13.25	9.61
doctor + primary health care nurse				9.61
clinical clerk	28.32	26.39		
administrative clerk	13.27		8.10	5.26

Time spent at meals and when there were no patients excluded

Table 5 - Average staff cost per patient in units *

job description	HTDMC	MOPD	polyclinic
doctor/s	1.82	3.36	2.03
doctor and primary health care nurse			2.23
clinical clerks	1.85		
total clinical attenders	3.67	3.36	2.23
other staff	1.93	2.26	1.39
all staff	5.60	5.62	3.61

* 1 unit = hourly salary of ward helper

Patients

Patients were seen in HTDMC and polyclinic from 0800 to 1600 hours every weekday. In MOPD doctors saw patients between 1000 and 1300 hours from Tuesdays to Fridays. Patients arrived in the clinics from about 0730 hours. In HTDMC new patients were seen only on Wednesdays. In MOPD and polyclinic new patients were seen on any day. All unbooked patients were seen on presentation.

The average daily attendance of all patients at HTDMC, MOPD and polyclinic was respectively 68, 96 and 182.

Pattern of out-patient disease

Only hypertensives and diabetics attended HTDMC. Most of the hypertensives suffered from mild or moderate disease, and most of the diabetics were not dependent on insulin. Patients with moderate and severe hypertension, insulin and non-insulin dependent diabetes, and less common chronic medical conditions as well as patients who had recently been discharged from the medical wards at the hospital were seen at MOPD. Patients suffering from mild and moderate hypertension, non-insulin dependent diabetes, and common acute and chronic diseases attended polyclinic. The frequency distribution of diseases at the three clinics is shown in table 6.

Table 6 - Pattern of disease of all patients attending the three clinics

	HTDMC	MOPD	polyclinic	MOPD + polyclinic	all three clinics
total number of diagnoses	2171	468	4126	4594	6765
% of all diagnoses					
hypertension	56	39	33	34	40
diabetes	21	17	5	6	12
hypertension + diabetes	76	56	38	40	52
heart failure + COAD	0	10	0	1	3
renal impairment	8	0	0	0	2
asthma	2	9	4	5	5
epilepsy	0	4	1	1	2
chronic conditions - total	87	79	43	47	63
anaemia	1	3	0	0	1
pelvic inflammatory disease	0	0	9	8	4
musculo-skeletal disorders	5	2	3	3	4
other diseases	7	16	45	42	28

Only 7% of HTDMC patients were given prescriptions for diseases unrelated to hypertension and diabetes. The rates among the hypertensives and diabetics from MOPD and polyclinic were respectively 34% and 24%.

Control of hypertension and diabetes

The last recorded blood pressure in the dispensary sample was used as an indicator of blood pressure control. The findings are shown in table 7. Diabetic control was not assessed because there were too few diabetics in the sample.

Table 7 - Last blood pressure reading [mm Hg]

	HTDMC			MOPD			polyclinic		
	mean	95% confidence intervals		mean	95% confidence intervals		mean	95% confidence intervals	
		(n = 23)			(n = 29)			(n = 21)	
systolic blood pressure	140	133	148	147	137	158	148	137	159
diastolic blood pressure	96	92	100	93	87	99	93	87	100

Organisational structure and process

1 Patient education

In HTDMC a comprehensive group and individual patient education programme on the putative causes and complications of hypertension and diabetes, their prevention and risk management, on other health-promotive, disease-preventive and self-care measures, and on how to use the clinic was fully integrated into patient-care. Audio-tape programmes made by the clinic staff were used when no patient-educator was present.

Dietary recommendations were discussed in detail. The recommendations were flexible, economically feasible, relatively cheap, and compatible with local custom. Their use by family and friends was encouraged. Good posture and aerobic and muscle-strengthening exercises were advocated as part of daily activity. The use of alcohol and tobacco was forbidden. Patients were warned not to use those commercially available medicines which were known to elevate blood pressure.⁴

There were no patient education programmes in the other two clinics.

2 Special investigations

Details of the policy and practice at HTDMC are shown in table 8. MOPD and polyclinic practice is shown in table 9. The daily number of urine and blood tests and the number per patient are shown in table 10. Costs are shown in table 11.

In HTDMC the doctor scrutinised the results of laboratory tests on receipt. Findings were interpreted and acted on. The results were entered into the patient's clinic-retained file within 2 days. No reports were lost. A few were wrongly transcribed. In MOPD and polyclinic reports were filed in the patients' folders by registered nurses usually at the patients' next visit. Many reports were mislaid, misfiled or lost.

Table 8 - Tests ordered and performed on HTDMC patients

test	place		frequency	comment
	specimen collected	test performed	of test [routine]	
urine				
glucose	EN	EN	4 weekly	5-test strip
ketones	EN	EN	4 weekly	5-test strip
albumin	EN	EN	4 weekly	renal impairment absent
albumin/creatinine ratio	EN	lab	prn	albuminuria present without UTI
blood				
blood urea	CC	CC	prn	severe renal impairment suspected
serum creatinine	CC	lab	annually	all in 1 specimen bottle
serum creatinine	CC	lab	prn	to monitor renal impairment
serum potassium	CC	lab	annually	all in 1 specimen bottle
serum potassium	CC	lab	prn	hypokalaemia suspected
glucose - diabetics	CC	CC	4 weekly	
glucose - non-diabetics	CC	CC	annually	
glucose - non-diabetics	CC	CC	prn	diabetes suspected clinically
glucose - non-diabetics	CC	CC	prn	total cholesterol high
HbA1C	CC	lab	prn	hardly ever
total cholesterol	CC	lab	annually	all in 1 specimen bottle
HDL cholesterol	CC	lab	annually	all in 1 specimen bottle
uric acid	CC	lab	annually	all in 1 specimen bottle
uric acid	CC	lab	prn	gout suspected
packed cell volume	CC	CC	annually	used micro-centrifuge
full blood count	CC	lab	prn	anaemia present, not iron-deficient
gamma GT	CC	lab	prn	alcoholic liver disease suspected
other tests				
mass		EN	4 weekly	
ECG		Dr's room	prn	hardly ever indicated or done
X-ray chest		X-ray unit	prn	pulmonary tuberculosis suspected
other radiological examinations		special	prn	at specialist's request - seldom

abbreviations:

EN: enrolled nurses' room, CC: clinical clerk's room
prn: when necessary, UTI: urinary tract infection

Table 9 - Tests ordered and performed on MOPD and polyclinic patients

test	place		comment
	specimen collected	test performed	
urine			
chemical analysis	PUR	PUR	9-strip paper, polyclinic diabetics only
micro,chem,culture, sensitivity	OSR	lab	
blood			
capillary blood glucose	PUR	PUR	polyclinic diabetics only
venous blood glucose	OSR	lab	mostly MOPD patients
HbA1C	OSR	lab	
urea, electrolytes +/- creatinine	OSR	lab	
lipid profile	OSR	lab	
uric acid	OSR	lab	
liver function tests	OSR	lab	
full blood count +/- ESR	OSR	lab	
other tests			
mass		PC	
ECG		OPD	infrequent, MOPD only
X-ray chest		X-ray unit	not infrequent
other radiological examinations		special	restricted in polyclinic

abbreviations: OPD: out-patient department, OSR: OPD specimen room
 PUR: polyclinic urine room, PC: corridor near polyclinic

Table 10 - Urine and blood tests on hypertensives and diabetics

	HTDMC (n = 68)			MOPD (n = 96)			polyclinic (n = 182)		
	in-house	laboratory	both	in-house	laboratory	both	in-house	laboratory	both
number of tests per day									
urine	48	4	52	0	8	8	108	3	111
blood	33	39	72	0	27	27	18	15	33
both	81	43	124	0	35	35	126	18	144
number of tests per patient									
urine	0.71	0.06	0.76	0	0.08	0.08	0.59	0.02	0.61
blood	0.49	0.57	1.06	0	0.28	0.28	0.10	0.08	0.18
both	1.19	0.63	1.82	0	0.36	0.36	0.69	0.10	0.79
ratio of laboratory to in-house tests									
urine		0.08						0.03	
blood		1.16						0.80	
both		0.53						0.14	

Table 11 - Cost of urine and blood tests on hypertensives and diabetics in units *

	HTDMC (n = 68)			MOPD (n = 96)			polyclinic (n = 182)		
	in-house	laboratory	both	in-house	laboratory	both	in-house	laboratory	both
cost of all tests									
urine	48	225	273	0	2455	2455	819	921	1739
blood	665	1745	2410	0	4242	4242	711	1906	2617
both	712	1971	2683	0	6698	6698	1532	2827	4359
cost of tests/patient									
urine	1.00	56.37	5.26		306.89	306.89	7.58	306.89	15.67
blood	20.16	44.74	33.47		157.11	157.11	39.53	127.05	79.31
both	8.79	45.84	21.64		191.37	191.37	12.16	157.05	30.27
ratio of cost of laboratory to in-house tests									
urine		56.37						40.49	
blood		2.22						3.21	
both		5.22						12.92	

* 1 unit = cost of urinalysis with 5-test strip paper

3 Treatment

An average of 678 prescriptions were filled at the out-patients' dispensary every day. Thirty-five percent of these prescriptions were for drugs used in the treatment of hypertension and diabetes. Of these 23% were for repeat prescriptions, and 3% had been prescribed in other units. Forty-one per cent of the hypertensive patients and a few diabetics from MOPD and polyclinic fetched repeat prescriptions.

HTDMC used drugs at the standard dose in all patients, MOPD in 45% of patients and polyclinic in 89% of patients. Thiazide diuretics were almost always prescribed in two or greater multiples of the standard dose in MOPD. Methyldopa was not used in HTDMC. It was prescribed for 67% of MOPD patients and for 50% of polyclinic patients. The dose of methyldopa was higher than the standard dose in 70% of MOPD patients and in 38% of polyclinic patients.

HTDMC prescribed 10 only paracetamol tablets for more than half the patients. MOPD prescribed a variety of non-steroidal anti-inflammatory drugs and/or more than 10 paracetamol tablets for almost half the patients and polyclinic prescribed paracetamol or a relatively cheap non-steroidal anti-inflammatory drug for a few patients. MOPD prescribed a tablet formulation of potassium chloride while the other two clinics prescribed the cheaper salt.

Other features of prescribed items are shown in table 12. There were too few diabetics in the sample for the cost of treating them to be calculated.

4 Compliance with attendance

HTDMC liased with employers, negotiated on behalf of patients for a reduction or wavering of their attendance fee, and used money from a private fund to assist needy patients with transport fares. Non-attenders at HTDMC were contacted within three days of missed appointments, and new appointments were made. Reasons for non-attendance were systematically investigated. In the other two clinics there was no programme to support punctual attendance. Defaulters were not traced.

Table 12 - Number of prescribed items and unit costs *

	HTDMC			MOPD			polyclinic			MOPD + polyclinic		
	mean	95% confidence intervals		mean	95% confidence intervals		mean	95% confidence intervals		mean	95% confidence intervals	
number of prescribed items per patient												
	(n = 25)			(n = 33)			(n = 24)			(n = 57)		
drugs for hypertension	1.26	0.85	1.67	3.74	3.11	4.38	1.71	0.68	1.33	2.89	2.40	3.37
drugs for HT and DM	1.28	0.88	1.68	3.82	3.19	4.45	1.95	1.47	2.43	3.00	2.53	3.47
other drugs	0.60	0.40	0.80	1.21	0.74	1.69	0.79	0.28	1.31	1.04	0.73	1.34
non-specific items **	4.60	4.35	4.85	0.30	0.12	0.48	1.46	1.15	1.77	0.79	0.50	1.08
total number of drugs	1.88	1.47	2.29	5.03	4.27	5.80	2.67	1.91	3.42	4.04	3.41	4.66
total number of items	6.48	6.04	6.92	5.33	4.57	6.10	4.13	3.39	4.86	4.82	4.26	5.39
cost in units of a 4-weeks' supply of drugs prescribed for the management of hypertension												
	(n = 11)			(n = 13)			(n = 16)			(n = 29)		
average cost per patient	14.63	3.21	26.11	30.95	17.42	44.47	18.37	11.21	25.58	24.00	16.53	31.47
average cost per drug	10.74	2.79	18.68	13.89	9.11	18.63	10.53	7.00	14.00	12.21	9.26	15.21

* 1 unit = cost of urinalysis with 5-test strip paper

** non-specific items = potassium and magnesium chloride salt, saccharine, methyl salicylate ointment and wheat bran

Eighty-eight per cent of HTDMC patients attended punctually and 35% were unbooked while at MOPD 52% attended punctually, and 44% were unbooked. It was not possible to determine how many polyclinic patients with chronic diseases attended punctually or were unbooked.

5 Compliance with recommended treatment.

The HTDMC's attitude on compliance was deliberately supportive, not judgmental. Education material and personalised hypertension and diabetes booklets written by the author reinforced recommendations on the total programme. Compliance with the non-drug programme was supported by example and by the routine supply of non-specific items. The correct use of prescribed items was monitored at each visit. Left-over medication and empty containers were carefully checked.

Compliance was not promoted or monitored at the other two clinics. Pill counts were not recorded. Non-specific items were supplied to some polyclinic patients. Other findings on structure and process are summarised in tables 13 and 14.

Table 13 - *Other structural features of the clinics*

feature	HTDMC	MOPD	polyclinic
staff			
in-service training	+	0	0
continuing professional development	+	0	+
own patients [continuity of care]	+	0	+
culture and language shared with patients	+	0	0
in-house records			
patient register and index	+	0	0
clinical questionnaire *	+	0	0
structured clinical record *	+	0	0
laboratory reports folder	+	0	0
other records			
	+	0	0
hospital-retained folder	+	+	+
hospital-retained prescription card	+	+	+
patient-retained hospital identity card	+	+	+
organisation			
number of queues for new patients	8		
number of queues for old patients	5 - 6		
number of queues for all patients		6 - 7	8 - 10
use of waiting time for patient education	+	0	0
continuity of care	+	0	+
arrangements with other departments			
filing clerks - help with hospital record retrieval	+	0	0
specialist consultations - patient escorted	+	0	0
dispensary - dedicated window and staff	+	0	0

* copies available from author

Table 14 - Other operational features at the three clinics

feature	HTDMC	MOPD	polyclinic
protocols			
management of complications	0	0	0
management of related conditions	+	0	0
management of other common diseases	+	0	0
referral to dentist, ophthalmologist and podiatrist	+	0	0
guidelines			
appointment structuring	+	0	0
drug treatment	+	0	+
non-drug management	+	0	0
criteria			
control of hypertension and diabetes	+	0	0
grading of urine and blood results	+	0	0
monitoring			
staff performance	+	0	0
clinical progress and outcome	+	0	0
patient compliance with non-drug and drug treatment	+	0	0
attendance and defaulter rates	+	0	0
arrangements with other departments			
laboratory - reporting of gross abnormalities	+	0	0
wards - care and comfort of clinic patients	+	0	0
unit kitchen - morning tea and sandwiches for patients	+	0	0
main kitchen - lunch for diabetics	+	0	0
evaluation - over previous 8 years			
ad hoc reviews	8	0	0
conference papers and posters	4 + 1	0	0
publications *	3	0	0

In-patients

The analysis of in-patient data was delayed until all but one of the patients had either died or been discharged. The exception was a diabetic amputee from HTDMC who had an infected stump and was in heart failure. His duration of stay was estimated at 200 days.

There were 70 hypertensive and diabetic in-patients in hospital during the 24-hour survey period. Sixty-seven folders were traced giving a response rate of 95%.

Thirty-seven per cent of the patients had previously attended one of the clinics.

All patients in the ward for more than three weeks had leg ulcers. Two HTDMC hypertensives, one of whom was also diabetic, suffered from renal impairment with retinopathy and three diabetics had Infections. Two MOPD patients were admitted in diabetic coma, 6 had infections, 1 was in renal failure and 3 suffered from moderate renal impairment. One MOPD patient had toxæmia of pregnancy, 4 were in heart failure and 3 had suffered a stroke. Three MOPD patients had an alcohol-related disease, compounded by overt malnutrition in one.

Hospital in-patient admission rates could not be calculated because there were no patient registers in MOPD and polyclinic. Other features are shown in table 15.

Table 15 - *In-patients on 1 day within survey week*

	HTDMC		MOPD		polyclinic		other		all
	number	percent	number	percent	number	percent	number	percent	number
number and percentage of all patients									
admissions	5	7	18	27	2	3	42	63	67
re-admissions	1	8	11	92	0	0			
prior defaulters	1	6	15	83	2	11			
deaths in ward	0	0	3	60	0	0	2	40	5
number and percentage of all diagnoses									
hypertension	2	5	11	25	1	2	30	68	44
diabetes	4	13	10	32	2	6	15	48	31
number of diagnoses per patient									
all diagnoses	3.80		3.44		3.00		2.71		3.00
not hypertension or diabetes	2.60		2.28		1.50		1.64		1.88
duration of stay in days of patients who did not die									
minimum	9		7		7		4		4
maximum	> 200		52		10		196		196
mean	*		23		*		32		31
median	*		16		*		14		15

* not done because of low numbers

Discussion

Validity and reliability of the data

One week in the life of a service may not reflect what happens most the time. However, where enough subjects are studied and if, where samples are used, their size is adequate, the subjects are randomly selected, and the response rate is high, the data could be valid.⁸ Some of the samples in this survey were however too small to qualify. The validity of the diagnosis of hypertension in polyclinic is questionable. Some patients were probably labelled incorrectly.

A review of routinely collected hospital data showed that staff complement and clinic attendance during the six months prior to the survey week did not differ from that observed during the survey week.

Indicators of effective out-patient intervention

The objective of medical intervention in hypertension and diabetes is not only to lower blood pressure and blood glucose but also to restore or approximate biological normality⁹ and to reduce the morbidity and mortality associated with their complications.

There were no hard outcome data, and data on intermediate outcomes were inadequate or unreliable. Since the number and nature of in-patient diagnoses is affected by admission policies and by the suitability of home conditions for home-care, data on in-patients could not be used as indicators of effective clinic care. Because good service delivery is conducive to disease management the following aspects of clinic functioning could serve as proxy indicators of effective intervention:

1 related diseases

The prevalence of diseases and complications associated with hypertension and diabetes reflects not only co-morbidity but also the pick-up rate of conditions which can only be diagnosed with blood and urine tests such as impaired renal function,

dyslipidaemia, and in hypertensives impaired glucose tolerance and mild forms of maturity-onset diabetes. Because HTDMC performed more tests to identify these conditions than the other two clinics and because results of tests in the latter clinics were often lost or mislaid comparisons were not possible.

HTDMC not only looked for these conditions but also managed them when present and tried to prevent their development. This did not apply in the other two clinics.

2 other diseases

Fewer HTDMC patients were medicated for diseases not directly associated with hypertension and diabetes than in the other two clinics. This may reflect better general health among HTDMC patients or an attendance behaviour pattern among patients in the other clinics predicated on seeking care for intercurrent ailments. Routine HTDMC patient monitoring data does not support another explanation, namely that HTDMC patients went elsewhere for attention.

3 compliance by staff

If evidence-based guidelines, protocols and criteria are present and followed as was the case in HTDMC good outcomes may be possible. Without them chances of successful intervention are less likely.

4 compliance by patients

Compliance with attendance and treatment was systematically monitored in HTDMC. The relatively high compliance and low defaulter rates there could have been influenced by the following factors:

4.1 the prescription

Prescriptions of non-drug measures and drugs must be practical, feasible, unambiguous, clear, understandable, and understood. Compliance with a drug prescription must be perfect and seen to be so. The correct dose must be taken at

the correct time. The amount issued must tally exactly with the number of days till the next appointment. Attendance must be punctual. If a drug is likely to produce unpleasant side-effects the patient should be fore-warned. Measures to improve compliance should be reinforced at every patient/care-provider contact. This was the policy and practice only in HTDMC.

4.2 staff-patient interaction

A successful consultation¹⁰ conducive to good compliance is promoted by good communication and a satisfactory staff-patient interaction. Both are in turn supported by:

- continuity of care
- mutual trust and respect
- staff accountability to patients and colleagues
- a clinic commitment to patient empowerment and advocacy
- a democratic culture with staff and patient participation in decision-making
- a staff attitude which is patient-oriented, tolerant, caring, concerned, and sensitive to the patient's socio-economic, political, cultural and historical reality
- a patient education programme based on a process of shared learning
- equitable access to transparent grievance resolution procedures.

These issues were only addressed in HTDMC.

4.3 duration of the consultation

There is a cut-off point in the duration of a consultation below which contact between a patient and a care provider may be useless, counter-productive or even iatrogenic. A short consultation could also increase the number of visits to the same or other institutions and staff.

In HTDMC the average calculated duration of the consultation between the clinical clerk and the patient was probably too long. In the other two clinics the time spent by the doctors with their patients may have been too short.

4.4 total experience

Chronically ill patients should be able to use medical facilities with minimum disruption to their work and other activities, in safety, at times convenient to them, and when affordable transport is available. Patients should be delayed in such facilities as little as possible,¹¹ there should be few queues, and the time they are obliged to spend there should be used productively. Patients should be able to enjoy their visits and should not be in any way distressed or discomforted. Some of these issues were successfully addressed in HTDMC, but not in the other clinics.

4.5 time and financial constraints

Patients who cannot afford to attend should be assisted with medical and transport costs and other relevant intercessions as was done in HTDMC.

4.6 defaulters

Defaulters should be traced and called in within a few days of their missed appointment as was done in HTDMC. Attention to defaulters also emphasises to patients the concern of the care-provider.

Costs

The use of unit costs allows rates to be adjusted against a universal standard so that the cost structure in the clinics can be compared with clinics elsewhere.

Cost-cutting alone may be expensive. An expensive service with a good outcome may be more cost-effective than a cheap service with a poor outcome.

Unit costs for urine and blood tests and for prescriptions were lowest in HTDMC but the differences were not in all instances statistically significant. Staff costs were lowest in polyclinic. This should be offset against the possibility that the service may have been ineffective in instances when the duration of the consultation was too short. In addition the following operational factors in the clinics may have improved the cost advantage of HTDMC:

1 appropriate staff deployment

1.1 use of time

In HTDMC the sharing of clinical responsibility between the clinical clerks and the doctor enabled a more productive use of the doctor's time. Patients were unevenly distributed throughout the day with many seen in the mornings and few in the afternoons. A predictable patient load predicated on punctual attendance and a functioning time-based appointment system could have enabled a better spread of patients, a larger patient-load per hour and a lower cost per patient. Staff should not be on duty when there is no work for them to do as was the case in MOPD. Time-stress, as may have occurred in polyclinic, is counter-productive.

1.2 staff roles

Nurses should not be used as interpreters, phlebotomists or laboratory technicians¹¹ as was done in MOPD and polyclinic. On the other hand an extended clinical role for nurses as in HTDMC may be appropriate. In a report on a programme for hypertension management in Sweden nurses were found to be better at caring for hypertensives than the physicians whom they replaced.¹²

1.3 staff competencies

In HTDMC there was no difference in competence among the clinical clerks between the staff nurse and the registered nurses. Less formally qualified nursing personnel and even lay people if trained in chronic disease care may be effective at monitoring patients' progress and could do so at a low cost. Such workers are more

likely to comply with protocols and may be able to communicate and empathise better with patients than more qualified workers can.

2 efficiency

Efficiency is improved by the use, as in HTDMC but not in the others, of:

- structured records
- criteria and protocols
- clinical audit and peer review
- regular policy and programme monitoring and evaluation
- continuing in-service training
- transparent and timely grievance resolution procedures

3 good compliance with attendance and treatment

Non-compliance is the most costly item in any medical service. Measures to improve staff and patient compliance could be offset against costs.

4 patient-load

A low prevalence of diseases unrelated to the index conditions in a dedicated clinic reduces both out-patient and in-patient work-load and cost.

In HTDMC patients were advised on how to prevent and self-manage diseases such as upper respiratory and urinary tract infections, and musculoskeletal disorders. Patients were assured of sick certificates if they absented themselves from work when ill with these diseases. This programme probably contributed towards the small number of patients presenting with these diseases to HTDMC.

5 special investigations

Unnecessary tests and lost results are wasteful of time and money. Pick-up rates of routine tests should be monitored. If these are low the tests should be discontinued, spaced further apart or only selectively performed. In hypertension and diabetes control programmes secular trends in mass and waist/hip ratio are cheap and useful indicators of disease status, risk of complications, and treatment compliance.

Point of care and in-house tests are preferable to laboratory investigations. Point of care tests are reliable and relatively cheap.¹³ They take up little time, do not require extra or special staff and facilities for specimen collection, labelling, dispatch and report-filing. The results can immediately be given to the patient, their implications discussed and necessary interventions initiated.

Results of laboratory tests that are available only after the patient has left should be scrutinised on receipt and recorded. Where necessary the patient should be contacted for immediate intervention. For this an accurate and up-to-date patient register is essential. Only HTDMC applied these measures.

6 prescriptions

The number, type, dose, and therefore the cost of drugs is affected by interventions that reduce the disease burden, by an effective non-drug regimen that tends to reduce the number and dose of medication¹⁴ and by adherence to prescription guidelines developed with cost constraints in mind. This applied in HTDMC.

Non-specific dispensed items were not in-expensive. In a less impoverished community these do not need to be prescribed unless they are not commercially available as was, and still is, the case in South Africa with potassium chloride salt.

Other considerations

HTDMC had more independence and flexibility than the other two clinics. This was possible because it was an experimental project and had the support of the senior

nursing and medical establishment. HTDMC also had access to a private fund that enabled it to acquire equipment and to assist needy patients.

The incidental finding that most in-patients had not attended any medical care facility before admission emphasised the need for improved access to services.

Conclusion

It is possible that the policies and practices at HTDMC contributed to a more cost-effective service for patients suffering from hypertension and diabetes than those which operated at the other two clinics. The generalisability of this conclusion to other common chronic conditions is however limited by the complexity of the applicable diagnostic criteria and treatment guidelines.

It was therefore proposed that a dedicated chronic disease care clinic be established to cater for patients suffering from hypertension, diabetes, obesity, asthma, non-rheumatoid musculo-skeletal disorders and epilepsy. The new clinic would use the methodology developed in HTDMC as modified by some of the findings from this survey. It was further proposed that the clinic be evaluated after not more than two years for safety and cost-effectiveness.

Post-script

The Department of Medicine accepted the recommendations. The hospital superintendent however prevented formal discussions with polyclinic staff and prohibited further negotiations. A chronic disease care clinic was not established. The HTDMC doctor was forced to resign, the nurse educator and one enrolled nurse were transferred out of the clinic, and HTDMC reverted to a conventional doctor-driven and staff-centred format.

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