A DESCRIPTION OF THE KNOWLEDGE, UNDERSTANDING AND OUTCOME OF DISEASE MANAGEMENT IN DIABETIC PATIENTS IN DEDICATED, SEMI-DEDICATED AND NON-DEDICATED INSTITUTIONS

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I, MAUREEN KHANYISA MLATI (RAMASOBANE), hereby declare that the work on which this discussion is based is original, except where acknowledgements indicate otherwise.

This dissertation is submitted for the degree Master of Science Medical in Pharmacy at the University of Limpopo. Neither the whole work nor any part of it has been submitted before for any degree or examination at this or any other University.

Signed …….. on the …… day of ……..

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SUMMARY

Diabetes Mellitus (DM) is a self-managed condition and it is essential for patients to have the relevant knowledge, skills and attitudes needed for successful diabetes management. Follow-up and proper counselling are major components in diabetes management as these will improve adherence and optimise diabetes management.

The aim of this study was to compare the knowledge, understanding and outcome of the disease management in four health institutions; a dedicated institution, a semi-dedicated institution and two non-dedicated institution.

The study objectives were: To describe the level of knowledge and understanding of diabetic patients in the management of their condition at the different institutions, to describe the outcome of diabetes management at the different institutions, to describe consulting and dispensing times for diabetic patients at the different institutions, and to obtain patients' perceptions on the quality of the health care services pertaining to the treatment of their diabetes.

A total of 120 patients were interviewed, 30 per institution. A questionnaire was used to collect data for the different objectives. Prospective and retrospective data were collected.

Knowledge of DM was assessed in ten patients from each institution. Patients were asked to explain their understanding on five aspects of the condition. Median scores for patients from the two non-dedicated institutions were compared using Wilcoxon two-sample test, and were found not to differ significantly for any of the questions or the overall score. The groups did not differ significantly in their understanding of whether there was a cure for diabetes mellitus and in their understanding of hypoglycaemia and its management. Patients at the dedicated clinic were significantly more knowledgeable of the condition, it's causes and their overall understanding of the questions asked. Hyperglycaemia and its management were understood significantly better by the patients at the dedicated

institution than those at the non-dedicated institutions, with patients at the semi-dedicated institution not differing significantly from either group.

The outcome of diabetes management was recorded from the patients file for a six month period. The proportions of elevated blood pressure results recorded at the three institution types differed significantly. The semi-dedicated institution had a significantly higher proportion of uncontrolled blood pressure results (33 of 55 results recorded, or 60%) than the non-dedicated institutions (32 of 91, 35%) or the dedicated institution (9 of 36, 25%,).

None of the ten patients at the semi-dedicated institution had all their values within the controlled range, as compared to six of 20 at the non-dedicated and six of ten at the dedicated institution. The glucose control was least achieved in patients at the semi-dedicated institution, where only one of ten (10%) of patients had no recorded value outside the controlled range, as opposed to four of ten (40%) at the dedicated institution and nine of eighteen (50%) at the non-dedicated institutions.

Median visit times differed between all types of institutions. Time spent on consulting and dispensing was the shortest at the non-dedicated (median=7min), it took longer at the semi-dedicated (median=9), and longest at the dedicated institution (median=18min).

The patient's perception on the quality of care was recorded for patients. They were asked whether they were satisfied with the amount of time that they spent with the healthcare worker. Patient satisfaction with visit time was not linked to the duration of the visit. Actual visit time did appear to be linked to patients' perception of whether they got enough time to ask questions. As for perceived quality of service, fewer patients were informed about their progress at the non-dedicated institution than at the others. Family members of fewer patients were educated at the dedicated than at the other institutions. More patients at the dedicated institution than at the other institutions were informed of treatment changes. Suggestions for improvement of patient care were made by 18% of

patients attending non-dedicated institutions, 23% of patients at the semi-dedicated institution and 63% at the dedicated institution.

The conclusion based on the results is that the more dedicated a service is, the better the diabetic care of patients. Patients at the dedicated clinic had more time with the health worker during consultation and dispensing of treatment. They were informed about treatment changes more than the patients at other institutions. Patients at the dedicated clinic also showed a better knowledge and understanding of their condition than patients in other institutions. They also had higher affirmative responses in terms of lifestyle modification as compared to the other institutions.

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DEFINITION OF TERMS

Dedicated institution

It refers to the health institution that specialises on a particular disease or condition e.g. dedicated diabetic clinic.

Patients are educated on the particular disease, through the means of different media e.g. printed material, lectures, group discussions, one to one interviews and videos. It also serves as a support group for individuals who are given opportunities to share their feelings and experiences. Follow-up of patients and evaluation of treatment is done for all individuals who are given appointments according to the individual progress in the disease.

Semi-dedicated institution

Patients attend a health institution but on arrival a professional nurse sees those with chronic medical conditions separately from other patients.

There is a brief interview with the patient, monthly routine tests are done, and medicine is given to the patient with instructions on how to take the medication. After six months patients are examined by a doctor and get a six-month repeat prescription. If patients are not controlled on their treatment they are sent to the doctor's room in the same institution before the six-month prescription expires.

Non-dedicated institution (hospital)

Patients with chronic medical conditions are seen like any other patients who come for other ailments.

These patients collect treatment every month, they wait in long queues, and the time spent with the doctor and pharmacist is very limited because of the workload. Monthly tests are done and

treatment is reviewed but there is very limited time to interview patients. Patients who are controlled on treatment are referred to a non-dedicated clinic to collect their treatment for six months.

Non-dedicated institution (clinic)

These are primary healthcare institutions where patients with chronic medical conditions are seen by nurses and receive their treatment from hospital.

Basic tests are done and patients are referred back to the hospital to be seen by a doctor and get a new prescription after six months. Patients that are not well controlled on treatment are sent back to the hospital before the end of the six-month period.

CHAPTER 1: INTRODUCTION

Most institutions in the Department of Health and Social Development in the Limpopo Province are not conducive for proper patient counselling. Doctors and pharmacists at hospitals are overworked and they have little time, if at all, to counsel patients with chronic medical conditions. Most primary health care clinics have a shortage of nursing staff and counselling does not take place. Dedicated clinics or specialized clinics no longer exist at health institutions, now there is integration of services (i.e. patients with different conditions attend the same clinic at any day of the week).

As part of practising pharmaceutical care, patients with chronic medical conditions at Seshego Hospital are often interviewed and counselled by the pharmacist. The pharmacist also refers patients to other health care professionals for intervention on their treatment regimens and disease management. From these interventions lack of proper counselling and follow-up is evident and poses a challenge for all health professionals.

This study aims to describe the knowledge, understanding and disease management in diabetic patients treated at a dedicated, semi-dedicated and two non-dedicated institutions.
The study objectives were: to describe the level of knowledge and understanding of diabetic patients in the management of their condition at the different institutions, to describe the outcome of diabetes management at the different institutions, to record consulting and dispensing times for diabetic patients at the different institutions, and to obtain patients' perceptions on the quality of the health care services pertaining to the treatment of their diabetes.

The study was conducted at four different institutions: a dedicated privately owned diabetic centre in Polokwane, a semi-dedicated public institution health centre in town - Rethabile health centre, a non-dedicated public institution district hospital – Seshego hospital, and a

non-dedicated public institution – rural clinic– Moletjie clinic. The next chapter discusses the literature review.

CHAPTER 2: LITERATURE REVIEW

Diabetes mellitus is defined as a syndrome characterized by hyperglycaemia resulting from absolute or relative impairment in insulin secretion and/or insulin action. Type 2 diabetes mellitus is usually diagnosed in patients above 30 years, but it also occurs in children and adolescents. It is characterised clinically by hyperglycaemia and insulin resistance (Beers, 1999).

Type 2 diabetic genetics are complex and manifest tremendous variability across populations. Numerous candidate gene studies have been conducted: genes such as the insulin and insulin receptor gene, glucose transporter genes, the HLA region of chromosome 6 (including DR3 and DR4), and genes controlling fatty acid, glycogen, and apo- and lipoprotein metabolism. Though there is evidence that type 2 diabetes has a strong genetic predisposition, no single gene defect explains the protean manifestation of this syndrome.

About 90% of patients are obese and may not display the classic symptoms of diabetes. Plasma insulin levels in type 2 diabetes may be high, normal or low, and the metabolic defects include:

- Impaired basal and stimulated insulin secretion
- An increased rate of endogenous hepatic glucose production, and
- Inefficient peripheral tissue glucose use.

Inactive receptors, desensitized receptors, or inadequate insulin action may contribute to these defects. Thus type 2 diabetics may exhibit a range of problems from insulin hypersecretion to exhaustion of islets cell activity accompanied by resistance of insulin action on various tissues. (DiPiro, 1999)

Diabetes mellitus is a chronic metabolic disorder. It is characterised by an absolute or a relative deficiency of insulin, often associated with peripheral insulin resistance. The aims of therapy need to be individualised. The short- term aim must be to relieve symptoms, overcome ketoacidosis and catabolism, and restore nutrient reserves and natural resistance to infection. Long-term aims may include attempts to increase life expectancy, to avoid vascular complications affecting quality of life, e.g. blindness, gangrene, renal failure, and to prevent infection, reactivation of tuberculosis. Improved glycaemic control reduces the risk of microvascular complications (retinopathy, neuropathy and nephropathy). Hypoglycaemia due to over-treatment with antidiabetic agents is a frequent and serious problem in the elderly. A MedicAlert identification should be worn at all times. Patients should be encouraged to participate actively in the management of their diabetes; it is essential that they be given a clear understanding of the disease and its management (South African Medicines Formulary, 2005).

Diabetes mellitus (DM) is a life-long chronic illness and its management is complex, demanding and sometimes tedious. Lewis Thomas once regretted that "Medicine is no longer the laying of hands; it is more like the reading of signals from machines" (Greef, 1993). However, with the correct application of information received from machines the pharmacist can offer a wealth of knowledge to the diabetic patient, enabling him to control his disease and thus preventing complications (Greef, 1993).

DM represents a syndrome with disordered metabolism and inappropriate hyperglycaemia due to:

- Absolute deficiency of insulin secretion, or
- A reduction in its biological effectiveness or
- A combination of the two.

In type 2 diabetes, patients can survive long-term without insulin replacement but many receive insulin so as to maximise their glycaemic control. Type 2 is a combination of:

- Impaired insulin secretion
- Insulin resistance (i.e. target tissues are insensitive to insulin) (Greef, 1993)

In recent years, developed nations have witnessed an explosive increase in the prevalence of DM predominantly related to lifestyle changes and the resulting surge in obesity. The metabolic consequences of prolonged hyperglycaemia and dyslipidaemia, including accelerated atherosclerosis, chronic kidney disease, and blindness, pose an enormous burden on patients with DM and on the public health system (Brunton, 2006).

Diabetes mellitus is a self-managed condition and as such it is essential for patients to acquire the relevant knowledge, skills and attitudes needed for successful diabetes management.

Diabetes education includes self-care education focusing on improving the patient's problem-solving ability as well as education of the family and the community. Patient education is an interactive, problem-solving process, which combines education and counselling skills to empower the patient to accept the practice of self-management on a daily basis (Department of Health, 1998).

In all diabetics, dietary modification and exercise are the cornerstones of diabetic management. Patients should be encouraged to participate actively in the management of their diabetes; it is essential that they be given a clear understanding of the disease and its management. Patients (and their families or friends) should be advised of the symptoms and treatment of hypoglycaemia and the importance of prompt action should be emphasised.

Advice should be given on personal hygiene, especially foot care, the risk of smoking and the danger of alcohol abuse. Ophthalmic examinations are indicated at yearly intervals.

Diabetic Education

Brown and Hannis (1995) conducted a pilot study with the purpose to determine the feasibility of providing a diabetic patient education and group support intervention. Results suggested statistically significant improvements in diabetes knowledge, fasting blood sugar levels and glycosylated haemoglobin levels (HbA1c). The study documented the feasibility and potential benefits of the intervention.

Raz *et al.*, (1998) investigated the influence of small group education sessions on glucose homeostasis in type 2 diabetes. After a 12-month follow-up of the intervention group, no significant improvement in their knowledge of diabetes could be demonstrated. However, mean fasting and postprandial blood glucose levels and HbA1c levels improved significantly in comparison with the control group. The same tendency was evident with the weight and lipoprotein profile. The authors concluded that educational group therapy can improve diabetes control in patients with type 2 diabetes.

Alcozer (2000) conducted a study to explore explanatory models of diabetes from the perspective of Mexican-American women with type 2 diabetes. The meaning of having diabetes was viewed as a life threat with complications and a shortened life. In conclusion the author states that: diabetic complications, viewed as symptoms, were structured in the explanatory models developed from the contextual arenas of family and community. Given the family and community history of diabetes, genetic predisposition to the disease, and perceived life threat, understanding Mexican American women's explanatory models about diabetes serves as a basis for negotiating therapeutic interventions.

Sarkadi and Rosengvist, (1999) identified a need for an effective and low-cost patient education programme. Their conclusion was that study circles held at pharmacies are a feasible way of educating persons with type 2 diabetes. Metabolic control as measured by HbA1c improved significantly after six months, but reverted to baseline levels again at 12 months. The reason for reverting back needs further investigation.

Ding *et al.*, (2006) conducted a cross-sectional study to evaluate the knowledge level of patients with and without diabetes in a large urban polyclinic using a 41-item questionnaire. One hundred and forty nine adults participated in the study. Patients with diabetes had higher overall knowledge scores than those without diabetes. While the overall knowledge of patients without diabetes appeared to be acceptable, several areas of knowledge deficiency were identified in this group.

Ooi *et al.*, (2007) conducted a study to assess the effectiveness of group education in improving patient awareness of foot care. They evaluated the effect of group size and areas in which knowledge seemed to be most affected. Their results showed the benefit of group education about foot care for patients with DM. Smaller groups benefited more than larger groups.

The reviewed literature indicates the importance and need for proper diabetes management, and also the importance for the patient to understand the disease and its treatment. There is still a need to do more research on the impact of education on the disease outcome. It is also apparent that the patient is the most important role player in the overall disease management, so research needs to ascertain all possible obstacles, which hinders optimum diabetes management.

Not much research has been conducted specifically on treating patients at different levels of care. But it has been shown from several research done that patient education is vital for self-management of diabetes. The reviewed literature support the type of setting of a dedicated clinic wherein patients are capacitated to take care of themselves.

Boren, (2009) conducted a literature review on costs and benefits associated with diabetes education and concluded that: The benefits associated with education on self-management and lifestyle modification for people with diabetes are positive and outweigh the costs associated with the intervention.

Brownson (2009) conducted a study to estimate the cost-effectiveness of diabetes self-management programmes in real-world community primary care settings. His findings were that self-management programmes for type2 diabetes are cost-effective from a health systems perspective when the cost savings due to reductions in long-term complications are recognized.

Scain (2009) did a study to evaluate the effectiveness of a structured education group program in metabolic control in patients with type 2 diabetes. He found out that a structured education group programme centred in self-management improves the glycaemic control in patients with type 2 diabetes.

The above mentioned studies describe the benefits of diabetic self-management programmes. This study aims to investigate if there is a difference in DM management outcomes if patients are seen at different patient care environments.

The next chapter described the methodology followed.

CHAPTER 3: METHODOLOGY

3.1 Aim and objectives

The aim of the study was to describe the knowledge, understanding and disease management in diabetic patients treated at a dedicated, semi-dedicated and two non-dedicated institutions.

The study objectives were:

- To describe the level of knowledge and understanding of diabetic patients in the management of their condition at the different institutions,
- To describe the outcome of diabetes management at the different institutions,
- To record consulting and dispensing times for diabetic patients at the different institutions, and
- To obtain patients' perceptions on the quality of the health care services pertaining to the treatment of their diabetes.

Study hypothesis

The overall quality of diabetic care is related to the dedication of health care services to diabetic patients; the more dedicated the service the better the diabetic care.

3.2 Study site

The study was conducted at four health institutions in Limpopo Province. The four institutions are:

A dedicated privately owned diabetic centre in Polokwane - diabetic centre

A semi-dedicated public institution health centre in town - Rethabile health centre

A non-dedicated public institution district hospital – Seshego hospital

A non-dedicated public institution – rural clinic– Moletjie clinic.

3.3 Study population

A total of 120 diabetic patients were interviewed i.e. 30 patients per institution. Adult patients with DM, type 2 who had been treated at the health institution for at least six months were

enrolled. The number of patients required to complete the different questionnaires are described below.

Questionnaire 1 to determine the knowledge and understanding of diabetic patients (Appendix B) and Questionnaire 2 to determine the disease management outcome (Appendix C) were completed by a total of 40 diabetic patients; 10 from each of the four institutions.

A total of 120 diabetic patients; 30 per institution, including the 40 patients who completed questionnaires 1 and 2, were interviewed to complete the questionnaire on the consultation and dispensing time (Appendix D) and on the patient's perception on the quality of care (Appendix E).

3.4 Sample selection and inclusion

A non-probability method with convenient sampling was used

The inclusion criteria were as follows:

- Type 2 diabetic patients
- 18 years and older
- Self – administering their own treatment
- Had been diagnosed with the condition and has been in the same institution for more than six months.

3.5 Study design

It is a descriptive study. Prospective and retrospective data were collected and data were analyzed using qualitative and quantitative methods.

3.6 Data collection

Patient demographic information was recorded on the Patient Demographic Form (Appendix A)

The data collection is described according to the different objectives:

Objective 1: To describe the level of knowledge and understanding of patients

Questionnaire 1 (Appendix B), which contains three parts, was utilised for data collection.

Part A – Questions on basic knowledge and understanding of the medical condition

Part B – Questions on basic knowledge and understanding of the pharmacological treatment

Part C – Questions on life style modification

Objective 2: To describe the outcome of diabetes management

Questionnaire 2 (Appendix C) was utilised for data collection. The following information was recorded from the patient's files retrospectively for a six month period: glucose level, HBA1c, BP level, body weight and medication.

Objective 3: To describe the consulting and dispensing times for diabetic patients at different institutions

Questionnaire 3 (Appendix D) was utilized. Consulting and dispensing times were measured. Timing was from the moment the patient entered the consulting room to the time that they came out and then from the moment the patient was called to collect the medicines to the time that he or she left the pharmacy. Exit interviews were done with patients to record the number of drugs prescribed, dispensed and to determine if they knew how to take their medication.

Objective 4: The patient's perception on the quality of the health care services

Questionnaire 4 (Appendix E) was utilized to collect the data. The questions determined whether the patients were satisfied with the amount of time that they had spent with the healthcare worker. The patients were also allowed to make suggestions on ways to improve the services.

3.7 Data collection process

The researcher collected all data. A staff member was requested to assist with collecting of information to record the consulting and dispensing times.

- The researcher first obtained consent from a diabetic patient as they enter the outpatient department.
- The consulting and dispensing times for the patients were recorded.
- After the patient received their medication, the researcher then interviewed the patient on their knowledge and understanding of the disease.
- Information was also collected from the patient's medical records.
- The patient care form was completed in full. The patient was interviewed on their perception on the quality of health care services.
- Demographic information was collected.

The whole procedure applied only for the first ten diabetic patients. For the remaining 20 only questionnaires 3 and 4 were completed.

3.8 Data analysis

3.8.1 Statistical analysis

Statistical analysis was performed using Microsoft Office Excel 2003 and SAS Version 9. 1.

3.8.1.1 Descriptive statistics

Descriptive statistics involve summarizing available data to give a concise picture of their distribution, and to make them comparable with summaries of other datasets.

Numerical variables analyzed included patient age, duration since diagnosis of diabetes mellitus, awareness scores, glucose levels, blood pressure and body weight. For this type of data, mean, median, standard deviation, and range for numerical variables were calculated. Conventionally, means and standard deviations are considered for normally distributed data, while medians and ranges or interquartile ranges are considered for skewed data. The Shapiro-Wilk test for normality was used to determine whether a variable was normally distributed.

Categorical variables, including gender, educational background, employment status and number of patients who gave positive responses to various questions, were summarized in terms of counts and proportions (percentages).

3.8.1.2 Inferential statistics

Inferential statistics are used to draw conclusions from specific datasets to population characteristics. Inferential statistical methods were used to compare results between types of institutions (dedicated, semi-dedicated, non-dedicated), and between non-dedicated Institutions I and II, in respect of the descriptive statistics mentioned above.

Pairwise comparisons of numerical data were performed using t-tests if the data were normally distributed, and Wilcoxon two-sample tests if their distribution was skewed (not normal).

Where more than two groups were compared, parametric analysis of variance for normally distributed numerical data, and non-parametric (Kruskal-Wallis) analysis of variance for numerical data with a skewed (not normal) distribution, were used to determine whether a difference existed somewhere between the groups. This overall test was followed up with pairwise comparisons to single out which groups differed significantly from which other ones, using t-tests for normally distributed data, and Wilcoxon's rank sum test (t approximation, 2-sided) for skewed data. Significance levels were adjusted using the Bonferroni method, i.e. the overall significance level of 0.05 was divided by the number of pairwise comparisons (three in the case of three groups) to avoid increasing the chance of a Type I error, i.e. falsely accepting the alternative hypothesis.

Proportions were compared by Chi square tests or by Fisher Exact test if counts in each cell were small. Where overall tests involving more than two groups were followed up by pairwise comparisons, Bonferroni adjustments of significance levels were applied as described above. Values of $p < 0.05$ were taken as significant.

3.9 Ethics

The study was approved by Medunsa Campus Research Ethics Committee (MCREC). Approval for the study and permission to access health institutions was also obtained from Limpopo Province Department of Health and Welfare. All participating patients gave informed consent by signing the form before the interview (Appendix E).

CHAPTER 4: RESULTS

4.1 Introduction

The chapter begins by providing a description of the demographics of the patients; followed by information regarding diabetes and other concurrent conditions. The findings are further presented according to the different objectives.

4.2 Demographics

4.2.1 Age

Table 4.1: Patient age

		Patient age (years)				
Institution	Number of patients	Normally distributed[1]	Mean ± SD	Pairwise comparison[2]	Median age (years)	Range (years)
Non-dedicated Institution I	30	N	61.7 ±13.7		67	33-85
Non-dedicated Institution II	30	Y	62.1 ±11.7		62	37-92
p (Wilcoxon two-sample test)					0.041	
Non-dedicated (total)	**60**	**Y**	**61.9 ±12.6**	**A**	**63.5**	**33-92**
Semi-dedicated	**30**	**N**	**57.6 ± 9.4**	**AB**	**57.5**	**38-73**
Dedicated	**30**	**Y**	**55.0 ±8.8**	**B**	**55**	**40-70**
p (means: parametric ANOVA, medians: non-parametric ANOVA)			0.016		0.010	
Total	**120**	**Y**	**59.1±11.3**		**59**	**33-94**
Of which: Female	82	Y	60.7±11.7		62	33-92
Male	38	Y	55.5±9.5		55	37-73
P (means: t-test; medians: Wilcoxon two-sample test)			0.019		0.010	

1) Shapiro-Wilk test
2) Pairs with different letters (e.g. A, B) differ significantly from one another. Pairs with same letters (e.g. A, AB) do not differ significantly from one another

Patients at the non-dedicated Institution I, were significantly older than those at Institution II.

Patients at the dedicated institution were significantly younger than those at the non-dedicated institutions.

Female patients were significantly older on average than male patients.

4.2.2 Gender

Table 4.2: Gender

Institution Type		Female	Male	p (Chi square test)
Non-dedicated	Institution I (n=30)	24	6	0.542 (NS)
	Institution II (n=30)	22	8	
Non-dedicated	(n=60)	**46 (77%)**	**14 (23%)**	0.15 (NS)
Semi-dedicated	(n=30)	**18 (60%)**	**12 (40%)**	
Dedicated	(n=30)	**18 (60%)**	**12 (40%)**	
Total	(n=120)	**82**	**38**	

Proportions of male and female patients did not differ significantly between non-dedicated Institutions I and II, or between institution types.

4.2.3 Education background

Table 4.3: Educational background

Institution Type	**Institution**	**Up to Std 4**	**Up to Std 5**	**Up to Std 8**	**Up to Std 10**	**College**	**University**	**Total**
Non-dedicated	I	19	2	5	2	1	1	30
	II	20	3	4	1	1	1	30
Total, non-dedicated		39	5	9	3	2	2	60
Semi-dedicated		14	9	2	3		2	30
Dedicated		0	1	1	3	9	16	30
Total		53	15	12	9	11	20	120
of which: Female		43	8	4	7	8	12	82
Male		10	7	8	2	3	8	38

As the counts in the individual cells of the table were too small to perform a Chi square test, and the Fisher Exact test takes a long time to compute exact probabilities for so many levels, data were summarized further before being compared statistically:

Four of 30 patients at Institution I and three of 30 patients at Institution II had completed Standard 10 or higher. There was no significant difference in educational background between the two non-dedicated institutions (p=0.688, Chi square test).

Seven of 60 patients (12%) at the non-dedicated institutions, 5 of 30 (17%) at the semi-dedicated institution and 28 of 30 patients (93%) at the dedicated institution had Standard 10 or more (p<0.001). In fact, more than half the patients at the dedicated institution had university education. Pairwise comparisons showed that **patients at the dedicated institution had significantly higher levels of education than those at the other two institutions.** The difference between the non-dedicated institutions and the semi-dedicated institution was not significant.

Male and female patients had similar educational backgrounds. Of 82 female patients, 55 (67%) had an education up to Standard 8, 27 (33%) had Standard 10 or more, while the corresponding proportions among 38 males were 25 (66%) and 13 (34%).

4.2.4 Employment status

Table 4.4: Employment status

Institution Type		Never employed	Employed in the past, but not at time of study	Total, unemployed	Employed	Pairwise[1]	p (Chi square test)
Non-dedicated Institution I	(n-30)	7	18	25	5		
Non-dedicated Institution II	(n=30)	5	22	27	3		**0.54 (NS)**
Total, non-dedicated	(n=60)	12	40	52 (87%)	8 (13%)	**A**	
Semi-dedicated	(n=30)	5	14	19 (63%)	11 (37%)	**B**	**<0.001**
Dedicated	(n=30)	0	9	9 (30%)	21 (70%)	**C**	
Total	(n=120)	**17**	**63**	**80 (67%)**	**40 (33%)**		
of which: Female	(n=82)	16	42	58 (71%)	24 (29%)		
Male	(n=38)	1	21	22 (58%)	16 (42%)		**0.165 (NS)**

1) Pairs with different letters (e.g. A, B) differ significantly from one another. Pairs with same letters (e.g. A, AB) do not differ significantly from one another

Data on employment status reflected the findings on educational levels. Overall there was a difference between institution types. All pairwise comparisons showed significant differences, meaning that the semi-dedicated institutions had significantly more employed patients than the non-dedicated ones, but significantly fewer than the dedicated clinic. The differences between males and females were not significant.

4.2.5 Chronic conditions

Table 4.5: Chronic conditions

Institution Type		Number of patients with			
		One chronic condition	Two chronic conditions	Three chronic conditions	p (Chi square test)
Non-dedicated	Institution I (n-30)	9	20	1	**0.360 (NS)**
	Institution II (n=30)	9	17	4	
Total, non-dedicated	(n=60)	18 (30%)	37 (62%)	5 (8%)	**0.321 (NS)**
Semi-dedicated	(n=30)	10 (33%)	16 (53%)	4 (13%)	
Dedicated	(n=30)	6 (20%)	17 (57%)	7 (23%)	
Total	(n=120)	**34 (28%)**	**70 (58%)**	**16 (13%)**	
of which: Female	(n=82)	22 (27%)	47 (57%)	13 (16%)	**0.476 (NS)**
Male	(n=38)	12 (32%)	23 (61%)	3 (8%)	

Patients attending the different types of institutions were comparable in terms of the number of chronic conditions they suffered from, and there was no significant difference between the two non-dedicated institutions or between genders.

4.2.6 Duration of diabetes mellitus

Table 4.6: Duration of Diabetes Mellitus

		Duration since diagnosis (years)				
Institution	Number of patients	Normally distri-buted	Mean ± SD	Pairwise compari son[1]	Median (years)	Range (years)
Comparison between non-dedicated institutions						
Non-dedicated Institution I	30	N	4.7±5.1	n/a	2	0.5-17
Non-dedicated Institution II	30	N	6.1±5.1	n/a	4.5	0.5-19
p (Wilcoxon two-sample test)					**0.112 (NS)**	
Comparison between institution types						
Non-dedicated	60	N	5.4±5.1	A	3	0.5-19
Semi-dedicated	30	N	8.6±6.7	B	5.5	0.5-30
Dedicated	30	N	8.6±5.9	B	7	2-26
p (non-parametric ANOVA)					**0.003**	
Total	**120**	**N**	**7.0±5.9**		**5**	**0.5-30**
Comparison between genders						
Female	82	N	7.3±6.4	n/a	5.5	0.5-30
Male	38	N	6.5±4.7	n/a	5	0.5-22
p (Wilcoxon's two-sample test)					**0.903 (NS)**	

1) Pairs with different letters (e.g. A, B) differ significantly from one another. Pairs with same letters (e.g. A, AB) do not differ significantly from one another.

The comparison showed that patients at the semi-dedicated and the dedicated institutions had diabetes mellitus for a longer median period than those at the non-dedicated institution. Male and female patients were similar in this respect.

4.3 Knowledge of Diabetes Mellitus

4.3.1 Knowledge of own chronic conditions

Patients were asked to enumerate the chronic conditions which they suffered from. Fifty-eight of 60 patients at non-dedicated institutions (all but one at each institution), all 30 at the semi-dedicated institution and 27 of 30 at the dedicated institution mentioned all of their

chronic conditions correctly (p=0.150, Fisher Exact test). There was thus no significant difference between institutions in this regard.

4.3.2 Basic knowledge and understanding of the medical condition

Knowledge of diabetes mellitus was assessed in ten patients from each institution. Patients were asked to explain their understanding of five aspects of the condition (see questions 3 to 7 in Part A of Appendix B). Answers were rated on a scale from 0-3 (0=patient does not understand, 1=patient knows about some isolated aspects, 2=patient has an idea, 3=patient understands).

The ratings to each question were found to be not normally distributed. The sum of scores for the five questions were normally distributed only in the subgroups of non-dedicated and semi-dedicated institutions, but not in the subgroup of patients at dedicated institutions, or overall. The results were therefore summarized and compared in terms of medians, using non-parametric methods (see Table 4.7).

Table 4.7: General understanding of diabetes mellitus as a condition

	Institution		**Type of institution**			
Question	Non-dedicated Institution I (n=10)	Non-dedicated Institution II (n=10)	**Total, Non-dedicated** (n=20)	**Semi-dedicated** (n=10)	**Dedicated** (n=10)	p (non-parametric analysis of variance)
	Median score (range) *p (Wilcoxon two-sample test)*		**Median score** (range) Grouping for pairwise comparison[1]			
Briefly explain what you understand about Diabetes Mellitus	1 (0-2)	0 (0-1) 0.339 (NS)	**1** (0-2) **A**	**1** (0-2) **A**	**3** (1-3) **B**	**<0.001**
Is there any cure for the disease?	3 (0-3)	3 (0-3) 1 (NS)	**3** (0-3) **A**	**3** (0-3) **A**	**3** (3-3) **A**	**0.149 (NS)**
What causes Diabetes Mellitus?	0 (0-2)	0 (0-1) 0.335 (NS)	**0** (0-2) **A**	**0** (0-2) **A**	**3** (2-3) **B**	**<0.001**
Briefly explain what happens in hypoglycaemia (low blood sugar), and how the condition can be managed	1 (0-2)	0 (0-3) 0.935 (NS)	**1** (0-3) **A**	**1** (0-2) **A**	**3** (0-3) **A**	**0.065 (NS)**
Briefly explain what happens in hyperglycaemia (high blood sugar), and how the condition can be managed	1 (0-1)	0 (0-3) 1 (NS)	**0** (0-3) **A**	**1** (0-2) **AB**	**2** (0-3) **B**	**0.012**
Total (sum of scores to above-mentioned questions)	9 (5-13)	8 (4-15) 0.706 (NS)	**9** (4-15) **A**	**10** (5-13) **A**	**18** (11-19) **B**	**<0.001**

(1) Pairs of medians with different letters (e.g. A, B) differ significantly from one another. Pairs with same letters (e.g. A, AB) do not differ significantly from one another.

Median scores for patients from the two non-dedicated institutions were compared using the Wilcoxon two-sample test, and were found not to differ significantly for any of the questions or the overall score.

The groups did not differ significantly in their understanding of whether there was a cure for diabetes mellitus and in their understanding of hypoglycaemia and its management.

Patients at the dedicated clinic were significantly more knowledgeable of the condition such as, the causes of diabetes mellitus, and in their overall understanding of the questions asked.

Hyperglycaemia and its management were understood significantly better by the patients at the dedicated institution than those at the non-dedicated institutions, with patients at the semi-dedicated institution not differing significantly from either group.

Confounding factors in this analysis were that patients at the dedicated clinic were particularly well educated, and had diabetes mellitus for a longer period than patients at the non-dedicated clinics (see comparison below Table 4.3, and Table 4.6).

The table below shows numbers of patients with different educational backgrounds that achieved knowledge scores between 5 and 20 as shown in Table 4.7 above.

Table 4.8: Educational backgrounds versus knowledge scores

	Education up to Std 8	Education at least Std 10	Total
Knowledge score 0-6	22	2	24
Knowledge score 7-15	6	10	16
Total	28	12	40

Six of 28 patients educated up to Standard 8 or less, as opposed to 10 of 12 patients educated to Standard 10 or higher, achieved an overall score of 12 or above ($p<0.001$, Fisher Exact test). It must thus be assumed that the distribution of knowledge scores was influenced by the educational background of the patients, rather than only by the type of institution attended.

Another confounding factor may have been the duration of diabetes mellitus since diagnosis, which was longer at the dedicated and the semi-dedicated institution than at the non-dedicated

one (see Table 4.6), although statistically, the correlation of duration since diagnosis and knowledge scores fell short of being significant (Pearson's correlation: p=0.068, Spearman's rank correlation: p=0.097).

A comparison of knowledge scores between gender groups showed no significant difference between male patients (median score=5, range=0-15) and female ones (median score=7, range = 1-15) (p=0.125, Wilcoxon two-sample test).

4.3.3 Basic knowledge and understanding of the pharmacological treatment

Patients were asked to enumerate the medicines they used for their diabetes. Table 4.9 shows the results.

Table 4.9: Knowledge of own antidiabetic medicines

Institution Type	Institution	Knew all their antidiabetic medicines	Did not know all their antidiabetic medicines	p
Non-dedicated	Institution I (n-10)	7	3	Fisher Exact **0.370 (NS)**
	Institution II (n=10)	4	6	
Non-dedicated	(n=20)	11 (55%)	9 (45%)	Chi square **0.637 (NS)**
Semi-dedicated	(n=10)	6 (60%)	4 (40%)	
Dedicated	(n=10)	4 (40%)	6 (60%)	

There was no significant difference between groups in this respect. Approximately half of the patients in each group knew all their own antidiabetic medicines.

Patients were asked to explain **how they took their medications**. Fifty-three of 60 (88%) patients at non-dedicated institutions (all except five at Institution I, and two at Institution II), 27 of 30 (90%) at the semi-dedicated institution and 29 of 30 (97%) at the dedicated institution could explain correctly how they took their medication (p=0.501, Chi square test). There was thus **no significant difference between patients at different institution types** in this regard.

Ten patients at each institution were asked whether they had **another source of getting medicines, e.g. alternative or complementary medicines**. All except two patients at the

non-dedicated Institution II and one patient at the dedicated institution said they had no other source of medication. The patient groups from the different types of institutions were thus similar in this regard.

The same ten patients at each institution were asked whether they had ever **been without treatment.** The results are shown in Table 4.10.

Table 4.10: Continuity of treatment

Institution Type	Institution	Have never been without treatment	Have been without treatment in the past	Pair-wise comparisons[1]	p (Fisher Exact test)
Non-dedicated	Institution I (n-10)	8	2		**1 (NS)**
	Institution II (n=10)	9	1		
Non-dedicated	(n=20)	17 (85%)	3 (15%)	**A**	**0.011**
Semi-dedicated	(n=10)	3 (30%)	7 (70%)	**B**	
Dedicated	(n=10)	7 (70%)	3 (30%)	**AB**	

(1) Pairs with different letters (e.g. A, B) differ significantly from one another. Pairs with same letters (e.g. A, AB) do not differ significantly from one another.

Patients' statements of having been without treatment in the past did differ between institution types. Pairwise comparisons showed that at the semi-dedicated institution, significantly more people mentioned past treatment interruptions than at the non-dedicated institution.

4.3.4 Basic knowledge and understanding of lifestyle modification

Patients were asked different questions on lifestyle modification. Affirmative answers to each of the four questions shown in Table 4.11 were counted as 1 point, and an overall score was calculated for each patient.

Like scores for knowledge of diabetes mellitus (see Table 4.6), lifestyle modification scores were not normally distributed, and were therefore analyzed in terms of medians.

Table 4.11: Elements of lifestyle modification

	Type of institution					
Question	Non-dedicated (Institution I) (n=10)	Non-dedicated (Institution II) (n=10)	**Total, Non-dedi-cated** (n=20)	**Semi-dedi-cated** (n=10)	**Dedicated** (n=10)	P[1]
	Affirmative responses					
Did you have to change your lifestyle since diagnosed with Diabetes Mellitus?	8	10	**18** (90%)	**10** (100%)	**10** (100%)	NS
Do you exercise?	5	4	**9** (45%)	**7** (70%)	**8** (80%)	NS
Do you take care of your feet?	1	5	**6** (30%)	**3** (30%)	**7** (70%)	NS
Do you plan your meals?	5	5	**10** (50%)	**6** (60%)	**9** (90%)	NS
	Median calculated scores					P[2]
Median sum of affirmative responses to above-mentioned questions (range)	2 (0-4)	2.5 (1-4)	**2.5** (0-4)	**2.5** (1-4)	**3.5** (2-4)	<0.001
Pairwise comparisons[3]			**A**	**A**	**B**	

(1) Fisher Exact test
(2) Non-parametric analysis of variance, medians printed bold were compared
(3) Pairs of medians with different letters (A, B) differ significantly from one another. Pairs with same letters (A, A) do not differ significantly from one another.

Counts and median total scores at Institutions I and II did not differ significantly (p values not shown). Proportions of patients attending the different institution types who gave affirmative responses to each question did not differ significantly, but overall median counts of affirmative responses were higher at the dedicated institution than at the other two institution types.

Table 4.12: Number of meals per day

Daily number of meals	Patient reports that s/he plans his/her meals		
	No	Yes	Total
Two	1	0	1
Three	9	15	24
Four	3	7	10
Five	2	2	4
Six		1	1
Total	15	25	40

Most patients reported having two or three meals per day. One person reported having two meals, without planning the meals. It was considered that the fact that the meals were planned was more indicative of lifestyle modification than the daily number of meals. The former was therefore included in Table 4.11 and in the overall calculated score on lifestyle modification.

4.4 Outcomes

The questionnaire allowed for a maximum of six values at monthly intervals for each of the clinical values, i.e. as at the date of the interview, in the previous month, and for months 3, 4, 5 and 6 from the interview date.

4.4.1 Weight

In total, 81 patient weights were recorded on the questionnaires. Between one and six weight values were available for each of ten patients treated at each of the non-dedicated institutions. Between two and five values were available from each patient treated at the dedicated institution. No weights were recorded for patients treated at the semi-dedicated institution in this study. As no body heights were recorded, obesity could not be assessed e.g. by calculating a Body Mass Index. Instead, the variation of the weights was considered. If there were two or more weights recorded, the difference between the last and the first recorded weight was calculated and expressed in terms of a percentage of the patient's first recorded weight. The results are shown in Table 4.13.

Table 4.13: Body weights recorded for study patients

		Body weight (kg)						
Institution	Patient	5 months before	4 months before	3 months before	2 months before	1 month before	At interview	Change from first to last
Non-dedicated Institution I	ND1_01	36	33	45		40	37	+3%
	ND1_02				97	96	100	+3%
	ND1_03						56	
	ND1_04						55	
	ND1_05						105	
	ND1_06				78	75	78	0%
	ND1_07	83	86	84	83	82	84	+1%
	ND1_08	76	68	72	72	77	80	+5%
	ND1_09	74	75	75	76	77	77	+4%
	ND1_10	74	78	77	75	78	78	+5%
Non-dedicated Institution II	ND2_01				75		75	0%
	ND2_02	70	70	71	72	74	72	+3%
	ND2_03						60	
	ND2_04	73	72	70	75		75	+3%
	ND2_05			65	70	65	65	0%
	ND2_06	85	85		85	84	85	0%
	ND2_07	42	43	43	43	43	43	+2%
	ND2_08	48	50	48	50	52	51	+6%
	ND2_09					85	88	+4%
	ND2_10	78	80	79	80	80	79	+1%
Dedicated Institution	D_01	95		95	92	94	90	-5%
	D_02	78	78	80	78		81	+4%
	D_03	86					86	0%
	D_04	70	72		74			+6%
	D_05			81		80		-1%
	D_06				64.5		63.5	-2%
	D_07							
	D_08		72			73.5		+2%
	D_09		81			81	80.3	-1%
	D_10			63	64			+2%

Four patients, all from the dedicated institution have shown weight loss over the monitoring period. Five patients remains at the same weight after 6 months, they are distributed throughout the different institution types. The rest of the patients showed weight gain of up to 6% the original weight.

The limitation was that, no height recorded for patients under the outcome of disease management only weight was recorded. If the height was recorded then the body mass index could be calculated from both the values. In the semi-dedicated clinic there was no weight reported for all patients.

4.4.2 Blood pressure levels

A total of 182 blood pressure readings were recorded for ten study patients at each institution. Patients were classified into three groups: Those with blood pressures below 140/90 (optimal), those with blood pressures of 140/90 or greater up to 160/95 (acceptable) and those with blood pressures above 160/95 (compromised). Patients with disparate measurements of systolic and diastolic for these stages were classified into the higher stage.(SA communication service, 1998)

Table 4.14 shows an overview of study patients' blood pressure levels. To give an overview of the stages as described above, elevated results are shown in bold; "acceptable" results are marked with one asterisk; and "compromised" ones with two asterisks.

Table 4.14: Blood pressure levels recorded for study patients

Institution	Patient	Blood pressure (SBP / DBP); *=acceptable, **=compromised					
		5 months before	4 months before	3 months before	2 months before	1 month before	At interview
Non-dedicated institution 1	ND1_01	80/60	70/40	120/80		110/60	90/60
	ND1_02				120/80	110/70	120/70
	ND1_03					**140/90***	**150/1 10***
	ND1_04						130/80
	ND1_05						**140/70***
	ND1_06				**140/90***	120/70	130/90
	ND1_07	**140/90***	130/90	**150/90***	**150/80***	110/60	**140/80***
	ND1_08	120/90	120/80	130/70	120/70	**150/90***	**150/80***
	ND1_09	120/80	**140/80***	130/90	**140/80***	**140/90***	**150/90***
	ND1_10	**140/80***	130/80	130/70	130/80	**150/90***	120/50
Non-dedicated institution 1	ND2_01	**150/90***	130/80	130/80	**150/90***	130/80	130/80
	ND2_02	130/70	120/70	**140/90***	120/80	120/80	110/70
	ND2_03	120/70	**150/90***			130/90	**150/100***
	ND2_04	130/70	**170/100****	**160/100****	**150/100***	**150/100***	**160/100****
	ND2_05		120/80		110/70	110/70	120/60
	ND2_06	**140/80***	130/80	130/70	120/80	130/70	130/80
	ND2_07	120/80	130/80	130/90	130/70	**150/90***	120/80
	ND2_08	90/50	100/60	120/80	120/80	120/80	120/80
	ND2_09					120/80	110/70
	ND2_10	**170/100****	**150/90***	**150/90***	**160/100****	130/90	130/70
Semi-dedicated institution	SD_01	130/80	130/90	130/90	**140/80***	**140/80***	**150/100***
	SD_02	120/80	130/90	130/70	120/70	120/80	**150/100***
	SD_03	**150/90***	**140/80***	**150/100***	**140/90***	130/90	**150/90***
	SD_04			**200/80****	**170/100****	**150/90***	**170/90****
	SD_05	**140/90***	110/70	110/70	**170/110****	130/90	**150/90***
	SD_06			120/80	120/80	120/90	**140/90***
	SD_07	130/90	130/80	120/90	**170/120****	**140/100***	**150/100***
	SD_08	**140/90***		**170/90****	**160/90***	**160/90***	**160/90***
	SD_09	**180/100****	**170/100****	130/90	130/80	**150/90***	**160/90***
	SD_10	**140/80***	**150/80***	**160/90***	**140/100***	130/80	130/80
Dedicated institution	D_01					110/75	110/80
	D_02	115/80	100/60	100/60	110/70		100/80
	D_03	**180/100****	135/70				**150/80***
	D_04	**145/87***	130/70	**140/80***	130/80		130/70
	D_05	130/85		**160/95***		**160/100****	**150/90***
	D_06	110/80	110/60		115/80		110/65
	D_07						135/80
	D_08		**140/80***	**140/80***	110/60	110/70	110/60
	D_09		120/85			125/85	100/70
	D_10		130/90	123/80	130/80		130/85

1=One month prior to interview; *=acceptable, **=compromised

Table 4.15: Number of elevated blood pressure values recorded at each institution

	Number (%) of blood pressure levels recorded				
	Non-dedicated institutions		Semi-dedicated institution	Dedicated institution	Overall
Blood pressure level	Institution I	Institution II			
Optimal	23 (59%)	36 (69%)	22 (40%)	27 (75%)	108 (59%)
Acceptable	16 (41%)	11 (21%)	25 (45%)	7 (19%)	59 (32%)
Compromised		5 (10%)	8 (15%)	2 (6%)	15 (8%)
Total	39 (100%)	52 (100%)	55 (100%)	36 (100%)	182 (100%)

The proportions of elevated results recorded at the three institution types differed significantly (p=0.001, Chi square test).

The semi-dedicated institution had a significantly higher proportion of uncontrolled blood pressure results (33 of 55 results recorded, or 60%) than the non-dedicated institutions (32 of 91, 35%) or the dedicated institution (9 of 36, 25%,).

Patients were grouped depending on whether all, some or none of their recorded blood pressure results were controlled, i.e. were below 140 mm Hg for systolic and below 90 mm Hg for diastolic blood pressure. The results are shown in Table 4.16.

Table 4.16: Number of patients with various levels of blood pressure control

	Number of patients				
	Non-dedicated institutions		Semi-dedicated institution	Dedicated institution	**Total**
Blood pressure control	Institution I	Institution II			
No values controlled*	2		2		**4**
Some values controlled*	5	7	8	4	**24**
All values controlled*	3	3		6	**12**
Total	**10**	**10**	**10**	**10**	**40**

* Controlled = not elevated, i.e. SBP < 140 mm Hg and DBP < 90 mm Hg

None of ten patients at the semi-dedicated institutions had all their values within the controlled range, as opposed to six of twenty at the non-dedicated institutions and six of ten at the dedicated institution. Blood pressure control was thus least well achieved by patients at the semi-dedicated institution.

4.4.3 Glucose levels

In total, 144 glucose values were recorded for the study patients. At the non-dedicated Institution II, there were two patients for whom no glucose values were recorded. The results are shown in Table 4.17. Values shown in bold are outside the controlled range of </= 11 mmol/L.

Table 4.17: Glucose levels recorded for study patients

		Glucose level (mmol/L)						
Institution	Patient	5 months before	4 months before	3 months before	2 months before	1 month before	At interview	Average
Non-dedicated Institution I	ND1_01		4.6			**15.0**	5.1	8.2
	ND1_02				6.7	10.4	9.2	8.8
	ND1_03						**12.9**	**12.9**
	ND1_04	**13.0**	**14.0**	11.0	10.0	**12.0**	**15.2**	**12.5**
	ND1_05						5.6	5.6
	ND1_06				10.5	7.4	8.7	8.9
	ND1_07	8.3	10.1	**12.2**	9.8	7.1	**13.3**	10.1
	ND1_08			5.2	6.6	9.8	7.7	7.3
	ND1_09	6.6	7.9	**11.8**	5.7	7.6	7.7	7.9
	ND1_10					2.0	4.5	3.3
	Average	9.3	9.2	10.1	8.2	8.9	9.0	9.0
Non-dedicated Institution II	ND2_01			6.0	5.0	5.0	5.0	5.3
	ND2_02			5.0		7.0	**11.3**	7.8
	ND2_03	**28.0**						**28.0**
	ND2_04					**16.6**	**13.3**	**15.0**
	ND2_05					**13.9**	**21.6**	**17.8**
	ND2_06	6.0						6.0
	ND2_07							
	ND2_08	5.0	5.0	5.0	9.0	9.0	5.0	6.3
	ND2_09							
	ND2_10						8.8	8.8
	Average	**13.0**	5.0	5.3	7.0	10.3	10.8	9.5
Semi-dedicated Institution	SD_01	3.6	5.6	9.6	2.5	4.9	6.7	5.5
	SD_02	6.9	**20.0**	**11.1**	**15.6**	11.0	7.4	**12.0**
	SD_03	**14.3**	**12.2**	**11.2**			**14.0**	**12.9**
	SD_04			8.9	**11.2**	**14.2**	9.2	10.9
	SD_05	**15.6**	**22.6**	**15.1**		**21.9**	**15.1**	**18.1**
	SD_06			**11.8**	7.6	8.7	**11.6**	9.9
	SD_07			**20.2**	10.3	**12.8**	**22.7**	**16.5**
	SD_08	5.9	5.2	7.0	9.8	6.4	**12.2**	7.8
	SD_09	**21.4**	**21.4**	**14.3**	**19.8**	**15.1**	**15.4**	**17.9**
	SD_10	9.9	9.4	10.4	**13.4**	**15.5**	**14.9**	**12.3**
	Average	**11.1**	**13.8**	**12.0**	**11.3**	**12.3**	**12.9**	**12.2**
Dedicated Institution	D_01	7.6				4.9	4.2	5.6
	D_02	4.3	5.9	**12.8**	4.6		**11.4**	7.8
	D_03	**14.2**	**12.6**				9.9	**12.2**
	D_04	5.1	6.8	6.8	**13.1**		6.8	7.7
	D_05	**14.1**		**13.8**		8.8	**20.0**	**14.2**
	D_06	5.2	5.2		5.5		6.1	5.5
	D_07						6.5	6.5
	D_08		**13.4**	**13.3**	3.0	**13.4**	8.2	10.3
	D_09		6.7			**15.4**	5.0	9.0
	D_10		8.9	9.7	5.4	4.1	6.2	6.9
	Average	8.4	8.5	**11.3**	6.3	9.3	8.4	8.7
Overall average of values		10.4	10.3	10.4	10.6	8.8	10.2	10.1

Table 4.18 shows numbers of controlled and uncontrolled readings for each institution.

Table 4.18: Controlled and uncontrolled glucose results per type of institution

	Number (%) of glucose levels recorded				
	Non-dedicated institutions		Semi-dedicated institution	Dedicated institution	Overall
Glucose level	Institution I	Institution II			
Elevated (>11 mmol/L)	9 (26%)	6 (30%)	29 (57%)	12 (32%)	56 (39%)
Controlled (≤ 11 mmol/L)	26 (74%)	14 (70%)	22 (43%)	26 (68%)	88 (61%)
Total	**35 (100%)**	**20 (100%)**	**51 (100%)**	**38 (100%)**	**144 (100%)**

A higher proportion of all values were outside the controlled range at the semi-dedicated institution than at the other institutions. When the two non-dedicated institutions were combined, statistical analysis showed that **the proportion of uncontrolled values was significantly higher at the semi-dedicated institution than at the non-dedicated ones ($p<0.002$).** The difference between the semi-dedicated and the dedicated institution just missed statistical significance ($p=0.018$, the adjusted significance level for this group of three pairwise comparisons is $0.05/3 = 0.017$).

Individual patients' glucose control was evaluated by grouping patients depending on whether all, some or none of their recorded glucose values were within the controlled range. Table 4.19 shows the numbers of patients at each institution in each of these subgroups.

Table 4.19: Number of patients with various levels of blood glucose control during study period

	Number of patients				
	Non-dedicated institutions		Semi-dedicated institution	Dedicated institution	Total
Glucose control	Institution I	Institution II			
No values controlled*	1	3	3	0	7
Some values controlled*	4	1	6	6	17
All values controlled*	5	4	1	4	14
Total	**10**	**8**	**10**	**10**	**38**

* Controlled = ≤11 mmol/L

The above breakdown confirms the impression from the previous table that glucose control was least well achieved in patients at the semi-dedicated institution, where only one of ten patients had no recorded values outside the controlled range, as opposed to nine of eighteen (50%) at the non-dedicated institutions and four of ten (40%) at the dedicated institution.

4.5 Consulting and dispensing times

The time spent on consulting and dispensing for each patient was observed. Consulting and dispensing times were added together, because it was only in one institution where consulting and dispensing were separate.

Table 4.20: Visit times (consulting and dispensing) in different institution types

		Visit time (minutes)				
Institution	Number of patients	Normally distri-buted[1]	Mean ± SD	Pairwise compari-son[2]	Median time (min)	Range (min)
Comparison between non-dedicated institutions						
Non-dedicated Institution I	30	N	6.6 ± 1.4		6	5-9
Non-dedicated Institution II	30	N	7.7 ± 1.3		8	6-11
p (Wilcoxon two-sample test)					**0.004**	
Comparison between institution types						
Non-dedicated (total)	60	N	7.2 ± 1.4	**A**	7	5-11
Semi-dedicated	30	N	9.6 ± 3.0	**B**	9	5-17
Dedicated	30	Y	17.9 ± 3.4	**C**	18	11-26
p (means: parametric ANOVA, medians: non-parametric ANOVA)					**<0.001**	
Total	**120**	**N**	**10.4 ± 5.1**		**8**	**5-26**

Median visit time differed between all types of institutions. Time spent on consulting and dispensing was shortest at the non-dedicated institutions (median = 7 minutes), it took longer at the semi-dedicated institution (median = 9 minutes), and longest at the dedicated institution (median = 18 minutes).

Table 4.21: Comparison of median visit times by gender

Gender	Number of patients	Normally distributed	Mean ± standard deviation		Median visit time (min)	Range
Female	82	N	10.2 ± 5.1		8	5-26
Male	38	N	11.5 ± 5.0		9	5-25
p (Wilcoxon two-sample test)					**0.247 (NS)**	

There was no significant difference between male and female patients with regard to time spent on consulting and dispensing.

Table 4.22: Comparison of median visit times by educational level

Educational level	Number of patients	Normally distributed	Mean ± standard deviation		Median visit time (min)	Range
Up to Std 8	80	N	8.2 ± 2.8		8	5-17
Std 10 or higher	40	N	15.0 ± 5.6		17	5-26
p (Wilcoxon two-sample test)					**<0.001**	

Educational level was a confounding factor, as it was found that patients at the dedicated institution had higher educational levels than those at the other two institutions. Accordingly, visit median time was longer for patients with higher educational levels than those with lower levels.

4.6 Patients' perceptions of the quality of care

Table 4.23: Perceived quality of care

Question	Type of institution					p (test as indicated)
	Non-dedicated (Fac I) (n=30)	Non-dedicated (Fac. II) (n=30)	**Total, Non-dedicated** (n=60)	**Semi-dedicated** (n=30)	**Dedicated** (n=30)	
What do you think about the time you spend with your health care worker during your visits?						
Too much	0	0	0	0	1	Fisher Exact
Too little	3	4	7	3	1	
Total, **not satisfied**	3	4	**7 (12%)**	**3 (10%)**	**2 (7%)**	NS
Enough, **satisfied**	27	26	**53 (88%)**	**27 (90%)**	**28 (93%)**	
Do you get enough time to ask questions from your health worker?						
No	2	4	6	3	0	Fisher Exact
Not always	1	2	3	1	0	
Total, **No**	3	6	**9 (15%)**	**4 (13%)**	**0 (0%)**	NS
Yes	27	24	**51 (85%)**	**26 (87%)**	**30 (100%)**	
Does the health worker inform you about your progress or the status of your condition?						
No	5	4	9	0	0	Fisher Exact
Not always	3	2	5	0	0	
Total, **No**	8	6	**14 (23%)**	**0 (0%)**	**0 (0%)**	<0.001
Yes	22	24	**46 (77%)**	**30 (100%)**	**30 (100%)**	
Have any of your family members been educated on your condition?						
No	2	2	**4 (7%)**	**2 (7%)**	**14 (47%)**	Chi square
Yes	28	28	**56 (93%)**	**28 (93%)**	**16 (53%)**	<0.001
Does your health worker inform you when your treatment is changed?						
No	10	16	**26 (43%)**	**15 (50%)**	**5 (17%)**	Chi square
Yes	20	14	**34 (57%)**	**15 (50%)**	**25 (83%)**	0.015

Table 4.24: Satisfaction with time spent, vs actual time spent per visit

Satisfaction with time spent	Number of patients	Normally distributed	Mean ± standard deviation	Median visit time (min)	Range
Enough (=satisfied)	108	N	10.6 ± 5.0	8.5	5-26
Too much (=not satisfied)	1		11	11	
Too little (=not satisfied)	11	N	9.27 ± 5.4	8	6-25

The groups of patients who were satisfied with the time spent on consulting and dispensing, and those who thought too little time was spent, both included a wide range of actual duration spent on these functions, with similar median durations. **Patient satisfaction with visit time** was thus not linked to short or long **actual visit duration**. Of 62 patients whose visit time was 8 minutes or less, 54 (87%) were satisfied with the time spent, compared with 54 (93%) of the 58 patients whose visit time was more than 8 minutes (p=0.273, NS, Chi square test).
On the other hand, **actual visit time** did appear to be linked to patients' perception of whether they got enough **time to ask questions**. Eleven (18%) of 62 patients whose visit time was up to 8 minutes felt they did not (or not always) get enough time for questions, compared with two (3%) of 58 patients with visit times over 8 minutes (p=0.12, Chi square test)

Table 4.25: Total affirmative answers to questions on satisfaction with health care

	Type of institution					
Question	Non-dedicated (Fac I) (n=30)	Non-dedicated (Fac. II) (n=30)	**Total, Non-dedi-cated** (n=60)	**Semi-dedi-cated** (n=30)	**Dedicated** (n=30)	p (test as indicated)
Median sum of affirmative responses to above questions (range)	4 (1-5)	4 (0-5)	**4 (0-5)**	**4 (2-5)**	**4 (3-5)**	Non-para-metric ANOVA **0.606 (NS)**

Comparisons between patients at the non-dedicated Institutions I and II showed no significant differences in any of the aspects (p values not shown).

Between types of institutions, there were some differences in the individual aspects of perceived quality of service:

- Fewer patients were informed about their progress at the non-dedicated institution than at the others

- At the dedicated institution, family members of fewer patients were educated than at the other institutions (this may have occurred in the past at other institutions, as most patients at the dedicated institutions had had diabetes mellitus for many years) and
- More patients at the dedicated institution than at the others were informed of treatment changes.

4.6.1 Suggestions for improvement of patient care

Suggestions for improvement of patient care were made by 11 of 60 (18%) patients attending non-dedicated institutions (5 and 6 respectively at each institution), seven of 30 (23%) patients at the semi-dedicated institution and 19 of 30 (63%) at the dedicated institution, i.e. significantly more than at the other two institutions ($p<0.001$, Chi square test).

The fact that more patients at the dedicated institution made suggestions than patients treated elsewhere does not necessarily indicate that they are less satisfied with the service received. These patients have been shown to be younger, better educated and living with diabetes mellitus for a longer time than the patients treated at the non-dedicated and semi-dedicated institutions. They may thus have greater imagination, knowledge and experience to come up with suggestions for improved patient care.

The results will be discussed in the next chapter.

CHAPTER 5: DISCUSSION

In the study, four institutions were studied; comparison was made between a dedicated institution, semi-dedicated and two institutions classified as non-dedicated. At the **dedicated institution** more effort was put on patient education and self-empowerment in the form of face to face discussions, support groups, self-monitoring patient cards, video, and printed material. Patients spent more time with the doctor during their consultation. Patients were seen by the same doctor almost always when they visited the institution. As a result we expect to see more continuity of treatment and trust from the patient's side. It is therefore anticipated that results at the dedicated clinic will indicate a higher level of knowledge and understanding from patients and a better outcome in the patient's disease management than at the non-dedicated and semi-dedicated institutions.

The **semi-dedicated** institutions see all kinds of patients but they separate patients with chronic conditions from other patients. Separating the chronically ill patients from the rest is a positive intervention in that they have different counselling needs. Monitoring the patient's progress is also made easier. The only weakness as compared to the dedicated institution is that the staff is always rotated and the patients are seen by different health workers when they consult, but it is anticipated that results will come out better than in the non-dedicated institutions.

The two **non-dedicated institutions**, a clinic and a district hospital are situated at a rural area. Patients come in for consultation but spend little time with the health-worker since there are many patients to serve and a shortage of staff. Often patient's prescriptions are not thoroughly reviewed. Chronically ill patients are not separated; they are seen with all other patients. These patients must be empowered to manage their own medical condition. In a case where there is no effort and time invested by the health-worker, a low level of knowledge and understanding and a poor outcome on the disease management is anticipated and patients are

not empowered to manage their own medical conditions, but are more dependant on the healthworker.

Because of the dedication and attention given to the diabetic patients it is expected that we would see a better outcome in disease management at the dedicated institutions compared to all the other institutions.

5.1 Patient demographics

The dedicated and semi-dedicated institutions are situated in the central business district in town. Patients at the non-dedicated institutions were older compared to the ones in the other institutions. Patients at the dedicated institution were the youngest. The reason could be that patients at the dedicated institution were generally better off financially. The results also indicated a high employment rate (70%) compared to 37% and 13% at the semi-dedicated and non-dedicated institutions respectively. The patients at the dedicated institution were more educated (93% had a Std10 or higher) and could be driving or paying for their own transport. Most patients from the dedicated institution were employed and had medical aid cover as compared to the older retired patients at the rural area.

The semi- and non-dedicated institutions offer a free service to the patients and were therefore affordable to the retired, old and unemployed. As a result the age is not similar to the general diabetic population. More of the patients were younger. They had a median age of 55 years compared to 63.5 years for the non-dedicated institutions.

Female patients were significantly older on average than the male patients. Females had a median age of 62 years and males 55years.

5.2 Knowledge and understanding of patients

There was no significant difference between institutions in terms of knowledge of individual patients as to which chronic conditions they were suffering from.

The majority of patients had two chronic conditions in all the institutions, fewer had one and the least had three chronic conditions.

The common conditions were diabetes and hypertension. Very few patients from all institutions did not know the chronic conditions they were suffering from.

Knowledge of diabetes mellitus

Patients at the dedicated clinic had better knowledge and understanding of the overall condition including its management. They were significantly more knowledgeable of the condition such as, the causes of diabetes mellitus, and in their overall understanding of the condition. Hyperglycaemia and its management were understood significantly better by the patients at the dedicated institution than those at the non-dedicated institutions, with patients at the semi-dedicated institution not differing significantly from either group.

Confounding factors were that:

- Patients at the dedicated clinic had the condition for a longer period than patients at other institutions.
- These patients were also more educated than in the other institutions.

The health worker spent more effort and time educating the patients during their consultation which was longest at the dedicated clinic. This supports the findings from Koura *et al.*(2001) who stated that "education of people with diabetes is the cornerstone of management…". It is assumed that the distribution of knowledge scores was influenced by the educational background of the patients, rather than only by the type of institution attended.

Educational Background vs. knowledge

Six of 28 patients educated up to Standard 8 or less, as opposed to 10 of 12 patients educated to standard 10 or higher, achieved an overall knowledge score of 12 or above. From these results, it is assumed that the distribution of knowledge scores was influenced by the educational background of the patients, rather than only by the type of institution attended.

5.3 Knowledge of own anti-diabetics

The knowledge of the groups on their anti-diabetic treatment was not different as between 40 to 60% of the patients in the group knew all their own anti-diabetic medicines. There is a serious short-coming with counselling and education in all institutions if only 52% of patients knew all their anti-diabetic mediation. It is also good to realise that even though 48% of patients did not know all their medication, 92% knew how to take the medication correctly.

It is also interesting to find out that 60% of the patients at the dedicated institution did not know their anti-diabetic medications even though they are highly educated and the time spent with the health worker is longer that the other institutions.

Diabetes must be self-managed by the patients and that is why it is necessary for patients to know all their medications and how they work (Norris *et al.* 2001). The other reason why the knowledge is of importance is because 70% of all patients had other concurrent chronic conditions (Ceriello *et al.* 2004). More patients at the semi-dedicated institutions were without medication for sometime than the other two types of institutions. The system of ordering is similar for semi-dedicated and non-dedicated clinics. There is no reason why they should be out of stock while the other institutions have the medication.

5.4 Basic knowledge and understanding of lifestyle modification

Patients at the dedicated institution appeared to be more aware of the correct lifestyle changes to be adopted. Overall affirmative responses were higher at the dedicated institution than at the other two institution types. The difference in responses is more likely to be attributed to the difference in education other than the contribution from the clinic itself.

Klug *et al.,* (2008) conducted a study, Healthy Changes for living with diabetes, addressing the gap between research and practice by describing the feasibility and outcomes of an evidence-based diabetes self-management healthy education program. They concluded that: The Healthy Changes program can be successfully translated into community settings and led by trained peer leaders, yielding health improvements similar to those reported in efficacy trials. Trained peer leaders are key to effective program implementation. Peer-led groups

enhance goal attainment by giving participants a venue to discuss obstacles and strategize solutions.

5.5 Outcome of Diabetic Management

The patients at the semi-dedicated institution had no weight values recorded. As there were no recorded body heights for all institutions, obesity could not be assessed, for example, by calculating a Body Mass Index. All four patients who lost weight were from the dedicated institution. The weight of five patients from the various institutions remained constant. Sixteen patients experienced weight gain of up to 6% the original weight.

Blood pressure levels

More patients at the semi-dedicated institution had uncontrolled blood pressure results than the non-dedicated institutions or the dedicated institution. None of the 10 patients falls in the category of all values controlled, compared to 3 each at the non-dedicated and 6 at the dedicated clinic. The results were not anticipated as the patient care and services at semi-dedicated clinic is in general expected to be better than the non-dedicated institutions.

Glucose control

Glucose control was least achieved in patients at the semi-dedicated institution, where only one out of ten patients had no recorded values outside the controlled range, as opposed to nine of eighteen at the non-dedicated institutions and four of ten at the dedicated institution. As with the blood pressure control it appears that the patients attending semi-dedicated clinics had fewer patients that had random glucose concentrations less than 11mmol/l. There was no patient in the dedicated institution who was classified under the category of "no values controlled" as compared to the semi-dedicated where there were three patients and non-dedicated four patients.

5.6 Consulting and dispensing times

Consulting and dispensing took longer at the dedicated institution compared to the other institutions. In most cases the dedicated clinic schedule appointments with their patients since only one doctor will be working and they had a rough estimation of the number of patients they will see per day. With the other institutions there will be a problem of over-crowding and you find health workers working very fast to be able to assist the high number of patients.

The amount of time spent by the doctor at the dedicated institution during consulting and dispensing is double the amount of time spent at the semi-dedicated institution and more than double compared to the non-dedicated institution. In addition to the consulting and dispensing times patients at the dedicated institution were also exposed to a support group, and other educational material. The effort contributed to a better outcome in disease management as revealed by the results in the following areas:

- General understanding of diabetes mellitus condition
- Affirmative responses in lifestyle modification
- Weight loss in the six months prior to the interview
- Controlled blood pressure (Table 4.16)
- Controlled blood glucose (Table 4.19)

5.7 Patient's perception on the quality of care

Patients who did not ask questions as they would have liked, reported that there were not enough time with the health worker compared to patients whose concerns were addressed.

At the dedicated institution, family members of fewer patients were educated on diabetes.

More patients at the dedicated institution than at the others were informed of treatment changes.

More patients at the dedicated institution (93%), were satisfied with the time they spent with the doctor during consultation compared to the ones at the semi-dedicated (90%) and non-dedicated (88%).

All patients at the dedicated institution (100%) said they had enough time to ask questions compared to the 87% at the semi-dedicated and 85% at the non-dedicated clinic.

These results were expected as seen by the consulting and dispensing times at the three institutions. In both dedicated and semi-dedicated all (100%) patients were informed about the status of their medical conditions compared to 77% at the non-dedicated institutions.

83% of the patients at the dedicated institution were informed about treatment changes, 50% at semi-dedicated and 57% at the non-dedicated institution.

All patients must be capacitated to manage their own chronic medical conditions and they must get support from health care workers. If health care workers do not inform patients about the status of their condition and also treatment changes, this practice removes the responsibility from the patient to manage their own condition. The patient can easily stop adherence to treatment if they are not aware of the consequences.

If a patient is informed and the healthcare worker together with the patient set goals this makes the patient to take responsibility to achieve the set goals anticipating better results at the next visit to the health care worker.

Suggestions for improvement of patient care

Suggestions for improvement of patient care were made by more patients who were at the dedicated clinic than the other clinics. This might be because these patients were younger, better educated and living with diabetes mellitus for a longer time than the patients treated at the non-dedicated and semi-dedicated institutions

CHAPTER 6: CONCLUSION

The aim of the study was to compare the knowledge, understanding and outcome of the disease management at different health institutions. From the results it can be concluded that: The more knowledgeable the patients are, coupled with a better understanding of how to manage their medical conditions, increases the likelihood that the patients disease outcome will be greatly achieved.

Another contributing factor to the increased outcome will be the way institutions are managed. The more dedicated a institution is, the more attention is given to the patients' needs.

When looking at the dedicated institution in terms of knowledge and understanding of their condition, the patients were better than in the other institutions. Also looking at the way the institutions were being managed for example, the dedicated institution took more time consulting with the individual patients. Patients at the dedicated clinic had more time with the health worker during consultation and dispensing of treatment. They were informed about treatment changes more than the patients at other institutions. There were also other supporting activities like, a support group and educational material to educate the patients.

The outcome of disease management was better in dedicated compared to the semi- and non-dedicated institutions. All four patients who lost weight are from the dedicated institution. Six at the dedicated clinic had all values controlled for hypertension compared to none at the semi-dedicated and three each at the non-dedicated institutions. There was no patient in the dedicated institution who was classified under the category of "no values controlled" as compared to the semi-dedicated where there were three patients and non-dedicated four patients. The effort that was put in at the dedicated institution paid off in the form of better outcomes and a higher level of knowledge and understanding as mentioned above.

The patient management at the two non-dedicated institutions did not differ, both were in rural areas, they were short staffed, patients of all conditions were seen in one place. The patients were much older, mostly not educated. The consulting and dispensing times were shortest and most patients indicated that they did not get enough time to ask questions from the health worker. Most patients were not informed when their treatment was changed.

The results of patients at the semi-dedicated clinic were not impressive, considering that the patients were separated from other patients in the institution i.e. They were given special attention, it was expected that they should have shown a better outcome on disease management than the non-dedicated institution patients.

The conclusion based on the results is that the more dedicated a service is, the better the diabetic care of patients, the better will be the level of knowledge and understanding of the condition by patients and hence a better outcome in disease management will result.

REFERENCES

Alcozer F. 2000. Secondary analysis of perceptions and meanings of type 2 diabetes among Mexican American women: Diabetes education 26(5):785-95.

Beers MH, Berkow R. 1999. The Merck Manual of Diagnosis and Therapy. 17TH edition Chapter 13: 165.

Boren SA, Gunlock T.L, Schaefer J, Albright A. 2007. Reducing risks in diabetic self-management, a systematic review of the literature: Diabetic education 33(6):1053-77.

Brown SA, Hannis C.L. 1995. A community – based, culturally sensitive education and group-support for Mexican American's with NIDDM: a pilot study of efficacy: Diabetes Education 21(3) 203-10.

Brown S.A, Harvist R.B, Villagomez E.T, Segura M, Barton S.A, Hannis C.L. 2000. Gender and treatment differences in knowledge, health belief and metabolic control in Mexican Americans with type 2 diabetes: Diabetes Education 6(3); 425 – 38.

Brownson C.A, Hoerger T.J, Fischer E.B, Kilpatrick K.E. 2009. Cost-effectiveness of Diabetes Self-Management Programs in Community Primary Care Settings: Diabetes Education.

Brunton L.L, Lazo J.S, Parker K.L. 2006. Goodman and Gillman's Pharmacological Basis of Therapeutics, 11th Edition, Chapter 61.

Ceriello A, Hanefeld M, Leiter L. 2004. Postprandial glucose regulation and diabetic complications: Arch Internal Medicine 164:2090-2095.

Clark C.A. 2006. Effects of breakfast meal composition on second meal metabolic responses in adults with type 2 diabetes mellitus: European Journal of Clinical Nutrition 60:1122-1129.

Department of Health. 1998. Diabetes. National programme for control and management of Diabetes Type 2 at primary level. Published by the South African Community Service on behalf of the Department of Health.

Ding CH, Teng CL, Koh CN. 2006. Knowledge of diabetes mellitus among diabetic and non-diabetic patients in Klinik Kesihatan Seremban: Medical Journal of Malaysia 61(4):399-404.

Di Piro J. 1999. Pharmacotherapy, 4th edition, a pathophysiologic approach. Chapter 70 1219-1220.

Fischer E.B, Thorpe C.T, Devellis B.M, Develis R.F. 2007. Healthy coping, negative emotions, and diabetes management: a systematic review and appraisal: Diabetes Education 33(6):1080-103.

Greef O.B.W. 1993. Pharmacotherapy, a guide to clinical pharmacy. Chapter 12, Medpharm Publications.

Gregg E.W. 2007. Prevalence of lower extremity diseases associated with normal glucose levels, impaired fasting glucose, and diabetes among U.S. adults aged 40 or more: Diabetic Research and Clinical Practice 77:485-488.

Hill-Briggs F, Gemmell L. 2007. Problem solving in diabetes self-management and control, a systematic review of the literature: Diabetes Education 33(6):1032-50.

Klug C, Toobert D.J, Fogerty M. 2008. Healthy changes for living with diabetes: an evidence –based community diabetes self-management program: Diabetic Education 34(6):1053-61.

Ko S.H. 2007. Long-term effects of a structured intensive diabetes education programme (SIDEP) in patients with Type 2 diabetes mellitus: a 4-year follow-up study: Diabetic Medicine 24:55-62.

Koura M.R, Khairy A.E, Abdel-Aal N.M, Mohamed H.F, Amin G.A, Sabra A.Y. 2001. The role of primary health care in patient education for diabetes control: Journal of Egypt Public Health Association 76(3-4):241-64.

Matteucci E, Giampietro O. 2003. Closing the gap between literature and practice, evaluation of a teaching programme (in the absence of a structured treatment) on both type 1 and type 2 diabetes: Diabetes Nutrition and Metabolism 16(5-6):298-305.

Medlife – drug information bulletin 2000. South African Pharmaceutical Journal.

Medunsa. 2001. Pharmaceutical Care and Communication skills, MSc notes.

Norris SL, Engelgau MM, Narayan KMV. 2001. The effectiveness of self-management training in type 2 diabetes. Diabetes Care 24:561-587.

Ooi G.S, Rodrigo C, Cheong W.K, Mehta R.L, Bowen G, Shearman C.P. 2007. An evaluation of the value of group education in recently diagnosed Diabetes Mellitus: International Journal of Lower Extremity Wounds 6(1):28-33.

Orchard T.J, Temprosa M, Goldberg R. 2005. The effect of metformin and intensive lifestyle intervention on the metabolic syndrome. The Diabetes Prevention Program randomization trial: Annals of Internal Medicine 142:611-619.

Ostbye T, Yarnall K.S.H, Krause K.M, Pollak K.I, Gradison Michener J.L. 2005. Is there time for management of patients with chronic diseases in primary care. Annals of Family Medicine 3(3): 209-214.

Raz I, Soslkone V, Stein P. 1998. Influence of small group education sessions on glucose homeostatis in NIDDM. Diabetes Care 11(1): 67-71.

Sarcadi A, Rosengvist U. 1999. Study circles at the pharmacy – a new model for diabetes in groups. Patient education and counselling 37(1):89-96.

Scain SF, Friedman R, Gross JL. 2009. A structured educational program improves metabolic control in patients with type 2 diabetes. Diabetes Education. 35(4):603-11.

Steed L, Cooke D, Newman S. 2003. A systemic review of psychosocial outcomes following education, self-management and psychological interventions in diabetes mellitus. Patient Education Counselling 51(1):5-15.

University of Cape Town. 2005. South African Medicines Formulary, 7th Edition. The South African Medical Association, Health and Medical Publishing Group.

Wright A.D. 2006. Hypoglycaemia in type 2 diabetic patients randomized to and maintained on monotherapy with diet, sulfonylurea, metformin, or insulin for 6 years from diagnosis: Journal of Diabetic Complications 20:395-401.

Yun L.S, Hassan Y, Aziz N.A, Awaisu A, Ghazali R. 2007. A comparison of knowledge of diabetes mellitus between patients with diabetes and healthy adults: A survey from North Malaysia : Patient Education Counselling 69(1-3):47-54.

APPENDIX A

DEMOGRAPHIC INFORMATION

DATE: ---------- **LOCATION**: ----------

PATIENT'S ID: ---------- **INTERVIEWER**: ----------

1. AGE----------
2. GENDER: MALE / FEMALE
3. DISEASE INFORMATION

3.1 ILLNESS	DURATION	TREATMENT
(a)	(a)	(a)
(b)	(b)	(b)
(c)	(c)	(c)

4. EDUCATION BACKGROUND

(Choose the most corresponding answer)

a. 0 – standard 4
b. Standard 5
c. Standard 8
d. Standard 10
e. College
f. University

5. OCCUPATION INFORMATION

5.1 Are you working at present (YES / NO).

5.2 If yes. What do you do? ----------

5.3 If no. Did you work before (YES / NO)

If yes. What did you do? ----------

APPENDIX B

QUESTIONNAIRE 1: Knowledge and understanding of the diabetic patients about the long-term management of diabetes mellitus.

PART A: MEDICAL CONDITION

1. What illness(es) / disease(s) are you suffering from?

   ……..

2. When were you diagnosed with Diabetes Mellitus

   …….

3. Briefly explain what you understand about Diabetes Mellitus

   ……

   ……

   .....……..

4. Is there any cure for the disease?
5. What causes Diabetes Mellitus?
6. Briefly expla in what happens in hypoglycaemia – low blood sugar and how the condition can be managed.
7. Briefly explain what happens in hyperglycaemia – high blood sugar and how the condition can be managed.

PART B : PHARMACOLOGICAL TREATMENT

1. What medicines are you usin g for diabetes……

……..

2. Please explain how you take your medications……

……

……..

3. Are there any instructions you have to follow while taking your medications (YES/NO)

3.1 If yes. A. do's…….

…….

B. Don'ts……

……

4. Are you taking the medicine as instructed? (YES/NO)

4.1 If no. Explain why…….…….

……

5. Do you experience problems as a result of the medication you are taking? (YES/NO)

5.1 If yes. Explain…….

……..

6. Do you use other medications not obtained from this institution? (YES/NO)

6.1 If yes. Where are you getting your other medication?……..

…….

6.2 What is the name of the medication…..……

7. Have you ever been without treatment (YES/NO)

7.1 If yes, explain what happened…….

…….

8. Do you take your medication even when you are not feeling sick?

…….

9. *How often* do you come to collect your treatment?……

PART C : LIFESTYLE MODIFICATION

1. Did you have to change your lifestyle since diagnosed with Diabetes Mellitus?

……

……

…….

2. Do you exercise? (YES/NO)

2.1 If yes. a.

When……..

b. How often ……

c. What kind of exercise ……..

2.2 If no. Explain, why not

…….

3. Do you take care of your feet? (YES/NO)

3.1 If yes. Explain

how……

……..

3.2 If no. Why not

……

4. Do you plan your meals?……..

4.1 How many times do you eat daily? ……

(Interviewer to mark with a cross inside the corresponding block)

TIMES	6h00	9h00	12h00	15h00	18h00	21h00	24h00	3h00
a. Full meal								
b. Light meal								
c. Snack								

5. What food do you eat for:

a. full meal? ……

b. Light meal?……...

c. Snack? ……

6. Do you deliberately avoid any food?

7. Do you deliberately avoid any drinks?

APPENDIX C

Questionnaire 2: DISEASE MANAGEMENT OUTCOME FORM

DATE: ---------- **LOCATION:** ----------

PATIENT'S ID: ---------- **DATA CAPTURER:** ----------

	INTERVIEW DATE	PREVIOUS MONTH	MONTH 3	MONTH 4	MONTH 5	MONTH 6
GLUCOSE LEVEL						
BP LEVEL						
BODY WEIGHT						
MEDICATION & DOSE						

APPENDIX D

Questionnaire 3: Consulting and Dispensing time data recording sheet

DATE:---------- **LOCATION:**----------

PATIENT'S ID:---------- **DATA CAPTURER:**----------

Consulting time:

Time in: ……. Time out: ……. Duration: ……...

Dispensing time:

Time in: ……. Time out: …… Duration: ……...

Drugs prescribed:

1. ……..
2. ……..
3. ……
4. ……
5. ……..……..
6. ……

Drugs dispensed:

Name	Adequately labelled Y/N	Patient knows directions Y/N
1.		
2.		
3.		
4.		

5.		
6.		

APPENDIX E

Questionnaire 4: PATIENT'S PERCEPTION ON THE QUALITY OF CARE

Choose the correct answer for question (1 – 3):

1. What do you think about the time you spend with your health worker during your visits?

a. Enough
b. Too much
c. Too little

2. Do you get enough time to ask questions from your health worker?

a. Yes
b. No
c. Not always

3. Does the health worker inform you about your progress or the status of your condition?

a. Yes
b. No
c. Not always

4. Have any of your family members been educated on your condition?

   ……..……...

5. Does the health worker inform you when your treatment is changed? ……

6. Is there anything that you would like to be done differently in this institution to the way they are doing it now?

   ……..……..……

   ……

   ……..…

   ……..……

   …….

APPENDIX F: CONSENT FORM

Statement concerning participation in a Research Project

Name of Project

A description of the knowledge, understanding and outcome of disease management in diabetic patients in dedicated, semi-dedicated and non-dedicated institutions.

I have been informed on the aims and objectives of the proposed study and was provided the opportunity to ask questions and given adequate time to rethink the issue. The aim and objectives of the study are sufficiently clear to me. I have not been pressurised to participate in any way.

I understand the participation in this Project is completely voluntary and that I may withdraw from it at any time and without supplying reasons. This will have no influence on the regular treatment that holds for my condition neither will it influence the care that I receive from my regular doctor.

I know that this Project has been approved by the Research, Ethics and Publications Committee of Medunsa. I am fully aware that the results of this Project will be used for scientific purposes and may be published. I agree to this, provided my privacy is guaranteed.

I hereby consent to participate in this Project.

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Name of patient	Signature of patient

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Place	Date	Witness

Statement by the Researcher:

I provided verbal information regarding this Project
I agree to answer any future questions concerning the Project as best as I am able
I will adhere to the approved protocol

Khanyisa Mlati		29 May 2003	Polokwane
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Name of Researcher	Signature	Date	Place