## 1. Introduction :

Type 2 diabetes mellitus is a chronic disease and it affects a patient's overall health and well-being in several ways. The appropriate treatment of a diabetic patient is based on the knowledge of the underlying pathophysiology of the disease. In South Africa, improving the quality of health care is an important focus for health systems development.[1] However, creation of a culture of quality requires commitment from health workers, patients and communities, with a major shift in existing thinking about health care.[2] Ultimately, quality stems from an attitude that fosters continuous service improvements,[2] by enthusiastic and motivated health care providers.[3] This service is based on patient and community needs and is delivered in conformity with established standards.[2]

Donabedian has provided a model for the assessment of quality of care, which consists of structure, process and outcome.[4] Structure refers to material and human resources and the organisational structure; process relates to health care provider and patient activities in giving and receiving care; and outcome denotes the effects of care on the health status of patients and communities.[4] Donabedian includes patient satisfaction as an outcome of care as well as an element of health status.[4]

There is general agreement that patient satisfaction is an integral component of service quality,[5-6] since expanded definitions of health service quality make explicit mention of patient satisfaction.[7] It has been proposed that the effectiveness of health care is determined by satisfaction with the services provided. Support for this viewpoint has been found in studies that have reported a satisfied patient is more likely to utilise health services,[8] comply

with medical treatment,[9] and continue with the health provider.[10] It is important to realize that the prevalence of depression and anxiety is approximately three times higher in patients with diabetes when compared with the general population and this can influence glycaemic control and satisfaction of the patient.[22] Intensive treatment would improve diabetic patients' outcomes in terms of morbidity and mortality, but the patients must be committed to long-term major changes in lifestyle for the effect to be beneficial. The problem is that the physician's concept of diabetes may be very different from the patient's and only if there is good communication between the patient and health care provider and the physician accepts patient autonomy can they implement a treatment plan that is acceptable to both with success in maintaining good glycaemic control.[24]

In 1975, the National Diabetes Commission's report to the United States Congress raised several issues concerning health providers attitudes towards diabetes mellitus.[31] This report suggested that attitudes were often inappropriate and could lead to apathy, anxiety, depression, insecurity, confusion and disorganisation in a diabetic patient's life. The Commission recommended the development of an attitude scale and proposed that attitudes should be assessed pre and post intervention activities.[11] In accordance with Donabedian's model,[4] attitudes affect the process component, which is linked to outcome. For example, inappropriate health care provider attitudes towards diabetic patients could lead to poor compliance with therapy and an increase in complications (poor outcome).

During the 1990s, there has been considerable interest in assessing the quality of health care for diabetic outpatients in South Africa.[12-15] Major

findings were: poor patient glycaemic and blood pressure control;[12] a high prevalence of diabetes complications;[12] inadequate examinations for treatable complications;[13] discrepancies between recommended care and practice;[14] staff/patient communication barriers[14] and a lack of comprehensive patient care.[15] These findings suggest that the quality of care for diabetic patients is poor. However, none of these studies used a model for assessing quality of care, or used a standardised attitude scale, or considered patient satisfaction as an outcome of care. It is important to understand that treatment satisfaction and health related quality of life are two distinct phenomena.[26]

Application of Donabedian's model[4] to these findings reveals that there are major problems in structure, process and outcome as well as the linkages between these components. For example, improved blood glucose and blood pressure control (outcome components) requires the activities of both health care providers and patients (process components). The focus on service activities demotes patients to passive recipients of health care. Overloaded clinics (organisational structure) are often blamed for inadequate examinations, discrepancies between recommended care and practice and the lack of patient education (process). Re-organisation may lead to better process and outcomes, but without service commitment and appropriate health provider attitudes, service activities will not improve.[2]

Most quality of care assessments were conducted in long-term ambulatory settings, without using a model to guide the research process, or attempting to assess patient satisfaction. Few studies have evaluated in-hospital care for diabetes mellitus or developed an intervention for improving the quality of health care. Yet, the hospital setting can provide an ideal opportunity for

optimising blood glucose and blood pressure control, screening for diabetes mellitus complications, patient education and health provider in-service training.

In a previous study it was found that improved glycaemic control is associated with favourable mood and possibly general well-being in type 2 diabetic patients.[23] By assessing quality of care from both health provider and patient perspectives, the present study will increase our understanding of the components of the quality of health care. In addition, the development and testing of the intervention will be invaluable for future policy and practice on improving the quality of health care for both diabetic outpatients and hospitalised patients.

In a small study where it was tried to alter the health care providers understanding of the diabetes consultation with a model of 4-5 sessions where they reviewed a videotaped consultation of the health care provider with a tutor, it was found that the health care professionals changed their ways of experiencing the encounter after the intervention.[25]

As few studies have addressed intervention for in-hospital care of diabetes mellitus, we set out to investigate if an educational intervention for doctors could improve the quality of care to diabetic patients. One of the practical restrictions was that there was only access to one Academic Tertiary Care Centre and that the models between different Tertiary Care Centres differ so much that another centre could not be used for comparison. Another problem was financial restrictions and therefore a before and after - intervention study was used.

## 2. Aims

### 2.1 Primary aim

The overall aim of the study was to investigate the effect of an educational intervention programme regarding diabetes on doctors' attitudes and practices

### 2.2 Secondary aim

To evaluate the effect on patient satisfaction of an educational intervention to doctors.

## 3. Objectives

### 3.1 Primary endpoints

The difference in the scores according to the Diabetes Attitude Scale(Appendix A) and Diabetes Practice Scale(Appendix B) before and after the intervention.

The difference in work-up of patients before and after the educational intervention

### 3.2 Secondary endpoints

Ascertain the descriptive epidemiology of diabetes admissions.

Ascertain patient satisfaction.

Develop and test the effect of an educational intervention on patient satisfaction.

This study was approved by the Ethics Committee of the Pretoria Academic Hospital.

# 4. Methodology:

## 4.1 Research Design

A repeat cross-sectional, observational study was conducted with hospitalised diabetic patients. An intervention-evaluation study was conducted on registrars, medical officers and specialists in the Department of Internal Medicine.

## 4.2 Study Site

Pretoria Academic Hospital was selected as the study site, due to the Principal Investigator's considerable involvement in the Diabetic Outpatient Clinic and the Diabetic Inpatient Ward.

## 4.3 Measures

Structured questionnaires, with consent forms for medical personnel and patients, were designed (Appendices A to E).

### 4.3.1 Diabetes Attitude Scale (DAS-3)

The DAS-3 consists of 33 items, in 5 subscales, that measure: (1) the need for special training; (2) the seriousness of type 2 diabetes; (3) the value of tight control; (4) the psychosocial impact of diabetes; and (5) patient autonomy (Appendix A).[16] Reliability coefficients ranged between 0.65 (psychosocial impact) and 0.80 (seriousness),[16] slightly lower than Nunnally's recommendation.[17] Health providers who were more involved with diabetic patients had a more favourable attitude towards the disease than those who spent less time with diabetic patients; and the attitudes of nurses and dieticians were more positive than those of physicians, providing some support for the validity of the scale.[16]

### 4.3.2 Diabetes Practice Scale (DPS)

A 5-item practice scale was designed for registrars and medical officers (Appendix B). The items included screening for complications, level of glucose control required prior to discharge and diabetes educational themes.

### 4.3.3 Patient Questionnaire

A patient questionnaire was designed to ascertain the epidemiology of diabetes, in-hospital work-up; and to monitor screening, glucose control, education received, co-morbidity,[18] health-related quality of life (HRQOL)[19-21] and patient satisfaction (Appendices C, D and E).

## 4.4 Sample Size

Twenty registrars/medical officers were required to complete the DAS-3 and the DPS. Two groups of 30 patients in each group were recruited for completion of the patient questionnaire. The sample size was based on previous studies to demonstrate a difference before and after the intervention.

## 4.5 Procedure

Two medical students from Rotterdam (The Netherlands), with assistance from two trained multilingual black interviewers explained the patient information and informed consent. The students explained the procedures and the interviewers translate when it was necessary to ensure understanding by the patients as the forms and survey instruments were only available in English. Thereafter the patients were enrolled only after they have signed the informed consent document. The interviewers administered the HRQOL and

patient satisfaction measures. An initial pilot study consisted of three patients to evaluate the methodology.

The Principal Investigator (Helena Oosthuizen), with assistance from a diabetes educator and the medical students, was responsible for the Educational Intervention. Patients received a study number and remained anonymous regarding the care they have received. Structured questionnaires were used and stored in a MS Excel file. A questionnaire was completed each week (Appendix F) to assess the burden on the health care system with regard to the number of patients managed in each firm, the number of doctors in each firm and the waiting times for referral.

The study was divided into three chronological sections. The first five weeks consisted of prospective follow-up of hospitalised patients with diabetes in the Department of Internal Medicine at the Pretoria Academic Hospital. A patient questionnaire was designed to ascertain the demography of diabetes and the health-related quality of life, as well as education received while the patients were in the hospital. This part of the study was conducted with the assistance of a trained, multilingual interviewer also fluent in several indigenous black languages. The in-hospital workup of the hospitalised patients regarding glucose control, bloodpressure control, screening for diabetic complications, co-morbidity[9] and treatment were evaluated. The co-morbidity index was done to assure that the two groups of patients assessed before and after the intervention were similar.

The second part of the study consisted of two educational intervention sessions. These sessions took place on two Thursday afternoons over two

consecutive weeks, each session lasting one and a half-hour. At the beginning of the first session, the attending doctors completed a Diabetes Attitude Scale (DAS-3) and a Diabetes Practice Scale (DPS). The DAS-3 consists of 33 items, in five sub-scales, that measures the following: the need for special training; the seriousness of type 2 diabetes; the value of tight control; the psychosocial impact of diabetes and patient autonomy. Reliability coefficients of the DAS-3 ranged, as quoted in the literature, between 0.65 (psychosocial impact) and 0.80 (seriousness)[10]. The DPS was designed for consultants, registrars and medical officers and consists of four open questions and seven treatment-related statements. The four open questions were: complication screening, contra-indications for 24-hour urine albumin assessment, optimal metabolic control in a diabetic patient and fundoscopy outcomes and the need for referral to an ophthalmologist. Reference values for the optimal metabolic control in a diabetic patient were the clinical practice recommendations 2000 from the American Diabetes Association.[11] The registrars use the American Diabetes Association's Clinical Practice Recommendations[11] as part of their training programme and as this was a later publication than the 1997 South African Guidelines[12] this was used as reference. The original seventh treatment-related question involved the combination therapy of insulin-sensitising oral agents and sulphonylureas or insulin, but since insulin-sensitising oral agents were not available in South Africa at the time of the study, this question was changed to whether combination therapy of repaglinide and sulphonylureas was acceptable. Responses to the seven treatment-related statements were based on a five-point Likert scale ranging from one to five (strongly disagree to strongly agree).[13]

After completion of the questionnaires descriptive statistics of the hospitalised diabetic patients of the first five weeks were discussed. Thereafter an interactive session was held, during which the doctors could perform fundoscopies on three diabetic patients. With the aid of a slit lamp and video-screens, an ophthalmologist evaluated these patients while giving a description of lesions and its management. The specialist and attendants discussed the criteria for referral to an ophthalmologist of different fundoscopy outcomes.

The second intervention session consisted of a discussion on the screening and diagnosis of diabetes, metabolic goals and new trends in diabetes management. This was followed by a lecture on the complications of diabetes (nephropathy, vasculopathy, neuropathy and the diabetic foot). Thereafter a diabetic educator highlighted important aspects regarding patient education such as diet and the pathophysiology of diabetes. Finally the attendants completed the DAS-3 and DPS for the second time, in order to determine the impact of the education.

The third part of the study involved another five weeks of prospective hospitalised diabetic patients follow-up. The data collected from this group of patients was used to ascertain the effects of the educational intervention.

## 5. Data Analysis

Firstly descriptive statistics were calculated and documented. Thereafter, the reliability (internal consistency) of the measures was assessed. Paired t tests and analysis of covariance (ANCOVA) were used to ascertain intervention effects. T tests, correlation coefficients and ANCOVA were used to compare the two groups of patients. Proportions at baseline and pre- and post-intervention evaluation were compared with the Fisher exact test. Paired pre and post intervention DPS and DAS scores on doctors attending both intervention sessions were compared with the Wilcoxson sign rank test. A p - value $< 0.05$ is regarded as statistically significant.

## 6. Results:

A total of fourteen doctors worked in the Department of Internal Medicine during the first five weeks of follow-up (twelve registrars and two medical officers). Fifteen doctors worked in the wards during the second five weeks of follow-up (thirteen registrars and two medical officers) of whom eight had been present at both interventions.

There were three doctors who attended both interventions and worked in the wards during both phases one and two. Twenty-three doctors attended both the first and the second interventions and only their data were analysed. There were 33 doctors at the first educational session and 31 doctors at the second intervention. This included doctors that were not working in the wards but in subspecialty departments. The results of the Diabetes Attitude Scale (DAS-3) are shown in table 1.

### 6.1 Table 1

Results of the Diabetes Attitude Scale (DAS-3).*

| Questions | Pre-intervention (N=23doctors) Median (Quartiles) | Post-intervention (N=23 doctors) Median (Quartiles) | P-value (Wilcoxon matched pairs test) |
|---|---|---|---|
| Need for special training. | 4.2 (4.2 ; 4.8) | 4.6 (4.2 ; 5.0) | 0.07 |
| Seriousness of DM. | 4.0 (3.9 ; 4.6) | 4.6 (4.0 ; 4.9) | 0.03 |
| Value of tight control. | 4.3 (3.9 ; 4.4) | 4.4 (4.1 ; 4.7) | 0.45 |
| Psychosocial impact of DM. | 4.0 (3.8 ; 4.5) | 4.0 (3.8 ; 4.5) | 0.22 |
| Patient autonomy. | 3.6 (3.5 ; 3.9) | 3.8 (3.5 ; 4.3) | 0.07 |

* Scale from one to five with five as the best score.

Pre and post intervention DAS-3 scores were compared in those attending both sessions only (n = 23). All five sub-scales showed an improvement. Statistical analysis pointed to significant differences in attitude regarding seriousness of diabetes mellitus (p = 0.03), while the DAS-3 score of need for special training and patient autonomy indicated a borderline significant improvement (p = 0.07).

As shown in table 2 the doctors' score on complication screening, importance of glycaemic control and insulin resistance and combination therapy with Repaglinide decreased. Only the latter difference was statistically significant (p = 0.04).

The other items of the Diabetes Practice Scale (DPS) improved, of which four were statistically significant: contraindication for 24-hour urine albumin sample (p < 0.01), optimal metabolic control in a diabetic patient (p = 0.01), progressiveness of disease (p = 0.04) and avoidance of progression of type 2 diabetes (p = 0.04).

## 6.2 Table 2.

Results of Diabetes Practice Scale (DPS).

| Questions | Pre-intervention (N=23 doctors) | Post-intervention (N=23 doctors) | Change | P-value (Wilcoxon matched pairs test) |
|---|---|---|---|---|
| **Component (maximum points for question)** | **Mean (SD)** | **Mean (SD)** | **Mean (SD)** | |
| Complication screening. (10) | 5.80 (1.27) | 5.80 (1.48) | 0.00 (1.96) | 0.88 |
| Contraindications for 24-hour urine albumin sample. (6) | 0.52 (0.90) | 1.70 (1.11) | 1.17 (1.07) | <0.01 |
| Optimal metabolic control in a diabetic patient. (9) | 3.83 (1.99) | 5.04 (1.50) | 1.21 (2.11) | 0.01 |
| Funduscopy outcomes and need of referral. (11) | 4.57 (1.41) | 5.22 (1.00) | 0.65 (1.03) | 0.01 |
| Effectiveness of oral agents. * | 2.17 (1.07) | 2.00 (0.67) | 0.17 (0.83) | 0.27 |
| Progressiveness of disease. † | 3.22 (1.24) | 3.96 (0.88) | 0.74 (1.42) | 0.03 |
| Importance of glycaemic control. * | 1.96 (1.22) | 2.04 (1.55) | 0.09 (1.53) | 0.78 |
| Importance of insulin resistance. * | 1.23 (0.43) | 1.41 (0.73) | 0.18 (0.59) | 0.18 |
| Glycaemic control and advancing age. * | 1.65 (0.78) | 1.48 (0.51) | 0.17 (0.72) | 0.25 |
| Avoidance of progression of type 2 diabetes. † | 2.04 (0.93) | 2.78 (1.31) | 0.74 (1.51) | 0.04 |
| Combination therapy with Repaglinide. * | 3.45 (0.80) | 3.86 (0.71) | 0.41 (0.80) | 0.04 |

* Scale from one to five with one as the best score.

† Scale from one to five with five as the best score.

Table 3 shows the upper limits of metabolic and blood pressure values as given by the doctors in this DPS question: optimal metabolic control in a diabetic patient. Answers regarding pre- and post-intervention values of LDL-cholesterol ($p = 0.01$), systolic ($p = 0.02$) and diastolic blood pressure ($p = 0.01$), changed significantly.

## 6.3 Table 3

Optimal Metabolic and Blood Pressure Control as Reported by the Doctors

| Question | Pre-intervention (N=23 doctors) | Post-intervention (N=23 doctors) | Change | Wilcoxon matched pairs test (p-value) |
|---|---|---|---|---|
| | Mean (SD) | Mean (SD) | Mean (SD) | |
| HbA1c (%) | 6.98 (0.98) | 6.95 (0.38) | 0.03 (0.88) | 0.83 |
| Total cholesterol (mmol/l) | 4.56 (0.50) | 4.56 (0.59) | 0.04 (0.62) | 0.98 |
| LDL cholesterol (mmol/l) | 2.93 (0.62) | 2.55 (0.55) | 0.39 (0.84) | 0.01 |
| Fasting glucose (mmol/l) | 6.53 (1.17) | 6.52 (0.59) | 0.01 (1.10) | 0.80 |
| Postprandial glucose (mmol/l) | 9.97 (1.37) | 9.29 (1.21) | 0.68 (1.64) | 0.08 |
| Bedtime glucose (mmol/l) | 8.41 (2.07) | 8.81 (1.54) | 0.40 (2.22) | 0.45 |
| Systolic blood pressure (mmHg) | 123.8 (7.77) | 128.4 (6.64) | 4.57 (8.11) | 0.02 |
| Diastolic blood pressure (mmHg) | 80.6 (4.35) | 83.6 (3.42) | 2.96 (4.75) | 0.01 |

In the first five weeks of the follow-up (phase 1), thirty-one patients were included in the study of which two died. Four patients were excluded. One of them refused to participate in the study. From the two minors that were enrolled in the study, permission was not obtainable from their parents or legal guardians. One patient was unable to answer questions.

In the second five weeks of the follow up (phase 2), thirty-two patients were included in the study. Seven patients were excluded. Two patients refused participation, two minors from whom permission could not be obtained and three patients were unable to answer questions.

Table 4 shows that the baseline characteristics of the study population did not differ significantly between phase 1 and phase 2.

## 6.4 Table 4.

Baseline Characteristics of the Study Population

| Variable | Phase 1 (N=31 patients) | Phase 2 (N=32 patients) | P-value |
|---|---|---|---|
| | **Mean (SD)** | **Mean (SD)** | |
| Age | 52 (18.6) | 50 (16.7) | 0.63 |
| | **Median (range)** | **Median (range)** | |
| Charlson comorbidity index | 2.17 (1.23) | 2.16 (1.27) | 0.84 |
| | **Number (%)** | **Number (%)** | |
| Male | 14 (45.2) | 16 (50.0) | 0.80 |
| Type 2 diabetes | 19 (61.3) | 18 (56.3) | 0.80 |
| Previous clinic: | | | 0.27 |
| Diabetic outpatient clinic | 10 (32.3) | 6 (18.8) | |
| Other clinic / hospital | 16 (51.6) | 16 (50.0) | |
| None | 5 (16.1) | 10 (31.3) | |
| Reason for admission : | | | 0.66 |
| New or uncontrolled DM | 16 (51.6) | 20 (62.5) | |
| Complicated DM | 7 (22.6) | 5 (15.6) | |
| Coincidental DM | 8 (25.8) | 7 (21.9) | |

Table 5 gives a description of the patient work-up. During the second five weeks, the doctors performed significantly better for foot-neuropathy assessments ($p = 0.03$) than during the first five weeks. Doctors also performed more fundoscopies or referred to an ophthalmologist more often ($p = 0.04$). Furthermore, there was a significant increase in therapeutic changes ($p = 0.01$) and educated patients ($p = 0.01$).

The patient satisfaction did not change statistically significantly when comparing patients admitted before and after the intervention.

## 6.5 Table 5.

Work-Up of Study Population

| Variable | Phase 1 (N=31) | Phase 2 (N=32) | P-value |
|---|---|---|---|
| | Mean (SD) | Mean (SD) | |
| Mean glucose (mmol/l) * | 10.4 (3.4) | 9.9 (3.0) | 0.49 |
| | Number (%) | Number (%) | |
| HbA1c : | | | |
| Test done | 13 (41.9) | 18 (56.3) | 0.32 |
| Urine albumin : | | | |
| Test done | 6 (19.4) | 6 (18.8) | 1.00 |
| Fundoscopy : | | | |
| Test done | 14 (45.2) | 18 (56.3) | 0.45 |
| Foot-vascular assessment : | | | |
| Test done | 3 (9.7) | 3 (9.4) | 1.00 |
| Foot-neuropathy assessment | | | |
| Test done | 1 (3.2) | 8 (25.0) | 0.03 |
| Therapy change : | | | |
| Therapy not adjusted | 15 (48.4) | 6 (18.8) | 0.01 |
| Therapy adjusted | 14 (45.2) | 25 (78.1) | |
| Patient educated : | | | |
| not educated | 15 (48.4) | 6 (18.8) | 0.01 |
| educated | 13 (41.9) | 23 (71.9) | |
| Patient educated by : | | | |
| Doctor | 3 (9.7) | 1 (3.1) | 0.07 |
| other † | 7 (22.6) | 14 (43.8) | |
| both doctor and other | 3 (9.7) | 7 (21.9) | |

* Mean glucose value over the last eighty-four hours before discharge.

† Dietician, nurse or student.

## 7. Conclusion

This study demonstrates that the knowledge and attitudes regarding diabetes, as measured with the DAS-3 and DPS, improved after the doctors attended the educational intervention. On the DAS-3 scale only the section on seriousness of type 2 diabetes showed a statistically significant change. The scores of need for special training and patient autonomy showed a non-significant trend towards improvement. The doctors scored the lowest on the questions regarding patient autonomy.

The upper-limits of the metabolic and blood pressure values in a diabetic patient, as given by the doctors, closely matched with the reference values.[11] After the intervention the work-up of patients in the hospital improved in a number of aspects.

Notably there was an increase in the number of foot neuropathy assessments performed after the intervention. A possible reason for improvement in the neurological assessments could have been that during the educational intervention the doctors were instructed how to use a monofilament and every doctor were given a monofilament. The number of foot vascular assessments remained at a low level. Possible reasons for this could be: no practical demonstration on evaluation of the peripheral vascular status and underreporting (assessments could have been done, but were not recorded in the file). The latter is a distinct possibility as the bedletter may mention "normal cardiovascular examination without referring to peripheral pulses specifically.

## 8. Discussion

The best type of study to perform in the ideal situation would have been a well-conducted randomised controlled trial (RCT). This removes allocation bias, and, although it does not guarantee that the groups will be identical, any differences between them are attributable to chance, and statistical methods are available to measure the probability that the observed differences in the outcome variables are due to chance.[29] In non-randomised studies adjustment need to be performed but cannot approximate the prognostic balance of randomisation.[30] One of the practical restrictions was that there was only access to one Academic Tertiary Care Centre and that the models between different Tertiary Care Centres differ so much that another centre could not be used for comparison. Another problem is financial restrictions.[27] It was also not possible to randomise doctors to either an intervention or no intervention as it would not have been possible to perform this in a double-blind method and due to small numbers all the doctors attended the academic sessions where the intervention was delivered. RCT evidence can focus clinicians on diagnosis-based interventions rather than on the development of individualised intervention strategies.[28]

The pre-and post-intervention study method was used as this was in the circumstances the best model to use. Another factor apart from the intervention could however have been responsible for the improvement in quality of care delivered to diabetic patients. One possibility could have been the Hawthorne effect although the doctors were not aware of when the evaluation of hospitalised patients would take place. The advantage was that allocation bias was not a problem as "comparable treatment groups" were studied.

The initial aim of sixty patients in the study was achieved. Although the sample was sufficient for our goals, a larger population sample would have been better. However, this number of diabetic patients evaluated accounts for seventeen percent (17%) of the total annual diabetic patients hospitalised in the Department of Internal Medicine. This probably reflects a representative sample of patients admitted during the year. Twenty-three doctors attended both the first and second intervention. The doctors during the first phase of the evaluation were not the same as those during the third phase of the evaluation. Neither did the treating doctors all attend the intervention sessions.

The ideal expectation was that the doctors present at the first and second interventions were the same and was also working in the same wards during phase 1 and phase 2. Unfortunately, this was not the case and this may have diluted the effect of the intervention. However the doctors would have been biased if they were informed that they had to stay in the same wards for the evaluation of the intervention. Because the second DAS-3 and DPS were completed immediately after the second intervention, only the short-term effect of the intervention on the attitude and knowledge could be measured. During the first five weeks of follow-up, the doctors did not know the exact aim of the study and thus were not influenced in their patient work-up. After the intervention, the doctors were aware of the control of their work-up and it is unsure if the improved work-up will be continued after this study. There is a great diversity of languages in South Africa and a multilingual interpreter helped some patients not proficient in either English or Afrikaans.

To our knowledge, few other studies have reported on a study of this nature, making it difficult to compare our results with other studies. An earlier study by Sharp and co-workers also used the Diabetes Attitude Scale and the seven treatment-related statements we used in the Diabetes Practice Scale.[10] Because we used the latest version of the DAS (DAS-3) we cannot compare all the results with this earlier study. Only two sub-scales were similar in both versions. The change in attitudes towards need for special training and patient autonomy in the other study[10] showed a statistical significant difference but in our study both did not reach a significance. The attitudes toward the seriousness of type 2 diabetes changed significantly in our study. The number of patients educated changed significantly due to the fact that the doctors were sensitised to this by the lecture given by the diabetic educator and if they did not give the education themselves they referred the patient to a dietician or sister to provide the patient with education on diabetes.

The patient satisfaction did not improve statistically significantly due to the fact that the patients started with a very high score before the intervention. The patients were even before the intervention very satisfied with the care that they were receiving. Thus there were no room to demonstrate any improvement.

Medical personnel could benefit from intensified training on different aspects regarding the care of a diabetic patient and therefore improve their levels of patient care due to better understanding of the disease, increased knowledge and changes in attitudes towards diabetic patients.

In conclusion, a short educational intervention resulted in some improvement in attitude, knowledge and patient work-up in the Pretoria Academic Hospital. Further research is needed to evaluate the long-term effects of such an educational intervention. This study emphasizes the need for outcome based continuing medical education of medical personnel.