Evaluation Of An Australian Multidisciplinary Diabetes Support Clinic

C LI WAI SUEN, H AW, E PAUL, J WONG

Citation

C LI WAI SUEN, H AW, E PAUL, J WONG. *Evaluation Of An Australian Multidisciplinary Diabetes Support Clinic*. The Internet Journal of Endocrinology. 2012 Volume 7 Number 1.

Abstract

Diabetes affects approximately 7.4% of Australians with far-reaching consequences for patients, their families and society at large. Diabetes-associated complications present a major health and economic burden. The management of diabetes and its complications can be challenging and requires multidisciplinary input. In this retrospective audit, we assessed the effectiveness of an interdisciplinary clinic in a hospital-based academic diabetes centre in metropolitan Melbourne, which employs endocrinologists, diabetes nurse educators, dietitians and other related specialties. The Diabetic Support Service (DSS) clinic was designed to support primary care by providing rapid assessment and management planning service (2-3 visits only) which can be continued and sustained in primary care. The main outcome was improvement in HbA1c. A total of 171 medical case records were audited revealing a mean decrease in HbA1c of 1.5% over a mean follow-up period of 4.4 months. Greatest improvement was observed in patients referred early in their illness. This promising finding supports the value of early referral and of a diabetic support service model within an academic diabetes centre. It also supports a multidisciplinary approach in improving glycaemic control in diabetes.

INTRODUCTION

Type II diabetes affects approximately 7.4% of the adult Australian population [1] and is a well-known risk factor for cardiovascular and cerebrovascular disease [2, 3, 4]. The incidence and prevalence of diabetes is increasing in Australia and there are now over one million Australians affected [5]. Managing diabetes and its complications require significant resources, and it was estimated that the economic cost of Type II diabetes in Australia was over $34.6 billion dollars as of 2008 [6].

General practitioners are the primary providers of diabetes management, however the increasing number and complexity of diabetic patients makes this task a major challenge.

Endocrinologists and diabetologists also provide specialist care to patients with diabetes in private and public settings. However sustainability of specialist long-term medical chronic disease management models is not possible with the projected increase in patient numbers. Ideally care involves a team of health professionals, and this model of co-ordinated care with a multi-disciplinary team has been shown to be very successful in the management of chronic diseases, including diabetes [7] [8] [9].

A support service based in an academic tertiary care centre can provide a comprehensive assessment and management plan for a patient with a chronic disease like diabetes. This plan worked out with the patient can be continued by the primary health care provider.

Using an interdisciplinary model of care, a clinic was designed to target patients with diabetes who were referred from general practice and from the acute hospital setting. The aim of the clinic was to provide short term assistance and support, then to hand back long term chronic disease care to the general practitioner and patient. Patients were seen for a maximum of three visits. The aim of the clinic was to improve glycaemic control and decrease cardiovascular risk. Similar models of care have been developed worldwide and have been shown to be effective. In Hong-Kong, a Diabetes Service was effective in managing poorly-controlled diabetes, with a 2.2% decrease in HbA1c over a median follow-up duration of 41 weeks. [10]

Patients with diabetes are at a particularly high risk of developing cardiovascular disease [3] [4] and in our population sample, greater than 30% of patients reported a past history of macrovascular complications. Primary and

secondary prevention of cardiovascular disease is important to reduce future events and certain classes of medications, in particular antiplatelet agents [11] [12], statins [13] [14] [15], ACE-inhibitors/ACE-receptor antagonist (ARA) [16] [17], and B-blockers [18] [19] [20] have been shown to be cardioprotective.

The Southern Health diabetes support service has been running for 5 years and the aim of this study was to evaluate the effectiveness of the service in improving glycaemic control. Secondary outcomes focussed on reducing cardiovascular risks, using prescription of cardioprotective drugs as a surrogate marker.

METHODS – MBS FUNDED MODEL CARE – HOSPITAL ADDITIONAL DNE FUNDING

The Diabetic Support Services (DSS) clinic was established at Dandenong Hospital, Southern Health located in metropolitan Melbourne. This clinic serves a large catchment area in the south east region of Victoria, including rural and regional areas, and sees approximately 1100 patients per year. The patients are from varied ethnic and socioeconomic groups and are referred to the clinic from either their general practitioner or the acute hospital setting. The DSS clinic has a multidisciplinary approach, and at each visit patients are usually seen by an endocrinologist, a diabetic nurse educator and a dietitian. Referral to other services including podiatry, nephrology and ophthalmology are also made if necessary. Consultations with the service are capped at three. Patients are primarily discharged back to their general practitioners for long term care as long-term chronic disease management by specialist endocrinologists are not retained in the acute sector.

The clinic is driven by evidence-based management plans and is in line with targets recommended by the Australian Diabetes Society (ADS) and the Royal Australian College of General Practitioners (RACGP). Proforma documents are used to standardise data collection and are shared with the patient and their primary providers.

We audited the records of patients who attended the DSS clinic from 2004 to 2009. Patient sampling was randomised with every third patient in the registry being selected into the study. The main inclusion criterion was a minimum of two DSS visits.

Exclusion criteria included patients who became pregnant and were discharged to the Gestational Diabetes Clinic, and those who developed diabetes secondary to conditions like pancreatitis.

The audit was done by two independent clinicians who were not members of the interdisciplinary team. History of hypertension and hypercholesterolaemia was based on report by the medical practitioner.

STATISTICAL ANALYSIS

All data were analysed using SAS software version 9.1 (SAS Institute Inc., Cary, NC, USA). The primary outcome was the difference in HbA1c between admission and discharge. This variable was assessed for normality and found to be well approximated by a normal distribution. We used linear regression to estimate the relationship of demographic and clinical factors with difference in HbA1c. McNemar chi-square test was used to compare changes in categorical variables between admission and discharge. Results from linear regression analysis were reported as parameter estimates with standard errors. Continuous data were expressed as mean ± standard deviation, ordinal data as median (inter-quartile range) and categorical data as count and proportions. A two-sided p value of 0.05 was considered statistically significant.

RESULTS

A total of 171 patients were included in our study. Information collected from medical records included demographics, duration of diabetes, medical treatment at admission and discharge, and the HbA1c level at admission (baseline) and discharge.

BASELINE CHARACTERISTICS

The mean age of participants was 55.6 years, with 62% males. As expected, our sample consisted mainly of Type II diabetics (156 or 84%). Time since diagnosis ranged from 3 months to 12 years, the median duration of illness was 5 years. Of the initial 171 patients, 24 of them failed to return.

With regards to medical treatment at baseline, 102 patients were on some form of oral hypoglycaemic agent, the most common being metformin (77 patients), followed by 66 on sulphonylurea.

Figure 1

Table 1. Characteristics of patients

Mean Age (years)	55.6
Sex:	
Male	106 (62%)
Female	65 (38%)
Language Spoken	
English	139 (81%)
Non-English speaking	32 (19%)
Type of Diabetes:	
Type I	24 (14%)
Type II	147 (86%)
Duration of diabetes (years)	
Mean	7.95
Median	5
Referral source	
• General Practitioner	72 (42%)
• Hospital	99 (58%)
Discharge destination	All
• General Practitioner	70 (41%)
• Private Endocrinologist	33 (19%)
• Chronic Disease Management Clinic	44 (26%)
• Unknown	24 (14%)

Figure 2

Table 2. Therapy at baseline and at discharge

Treatment	Baseline	Discharge
Only diet-controlled	17 (10%)	13 (8%)
Oral hypoglycaemic agents		
• Metformin	77 (45%)	85 (50%)
• Sulphonylurea	66 (39%)	68 (40%)
• DPP4 inhibitor	0 (0%)	0 (0%)
• Thiazolidinedione	13 (8%)	13 (8%)
• Acarbose	4 (2%)	5 (3%)
Insulin	79 (46%)	89 (52%)

COMPLICATIONS

Table 3 demonstrates the rate of complications and common co-morbidities in our diabetic patients.

A large proportion of patients had dyslipidaemia (66 %) and hypertension (66%).

Figure 3

Table 3. Rate of documented complications and co-morbidities

	Patients, n	Percentage
Hypercholesterolaemia	112	66%
Hypertension	113	66%
Macrovascular complications	48	28%
•*Ischaemic Heart disease*	43	25%
•*Cerebrovascular accident*	9	5%
Microvascular complications	88	51%
•*Nephropathy*	60	34%
•*Retinopathy*	34	20%
•*Peripheral neuropathy*	34	20%
•*Autonomic neuropathy*	6	4%

HBA1C

In our study, a comparison was made between the baseline HbA1c on service admission and HbA1c achieved at discharge. A total of 115 out of 171 patients had HbA1c measured both at admission and at discharge. The main reasons for missing HbA1c at discharge included a discharge date within 3 months of the previous HbA1c or patient missing their HbA1c measurement prior to their discharge.

The mean improvement in HbA1c was calculated for the 115 patient. This demonstrated that there was a significant improvement in glycaemic control following attendance at the clinic. The mean HbA1c at the time of service admission was 9.2%, compared to 7.7% at discharge (p value of <0.0001). This translates to a mean reduction of HbA1c of 1.5%. It is also important to note that that the glycaemic control of our participants was achieved in a gradual fashion, over a median period of 4.4 months.

Using a HbA1c of < 7 as an indicator of good glycaemic control, the percentage of patients within the target range increased from 13.9% at baseline to 34.8% on discharge (p value < 0.0001).

Patients were also studied with respect to their referral source. Patients referred from hospitals were found to have higher HbA1c at baseline and discharge (9.6% and 7.8% respectively), compared with those referred by GPs (8.7% at baseline and 7.6%). Hospital-referred patients showed a larger improvement of 1.8% compared with 1.1% for the other group, although this was not statistically significant.

Various factors affect control of T2DM, including the nature

of the management, duration of treatment, and involvement of an interdisciplinary team.

From our data analysis, the duration of illness at the time of DSS Clinic intervention had a statistically significant impact on the improvement in HbA1c (p value = 0.01). Patients who were referred earlier to the DSS clinic appeared to have a more significant improvement in their glycaemic control. With every increase in year from diagnosis, the estimated associated improvement in HbA1c was decreased by 0.062%. This data is demonstrated in the graph below (Figure 1).

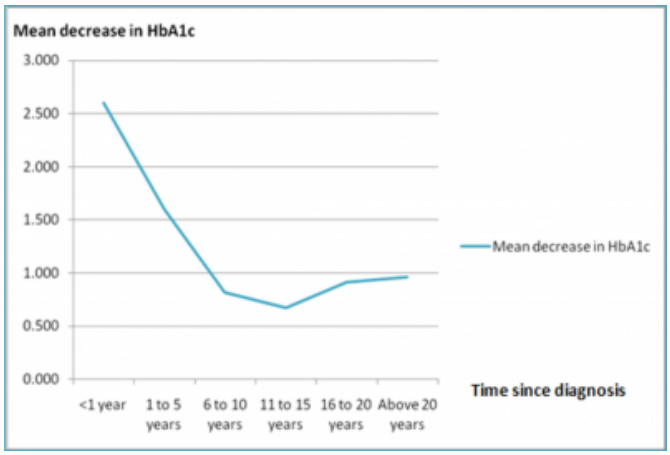
With the aim of studying the impact of early referral on the improvement in HbA1c, we also analysed our patients as two separate groups. In order to better ascertain within subject change in glycaemic control, only patients with two measurements of HbA1c were considered. Group A consisted of patients referred early in their course of disease (i.e. within one year of diagnosis, n= 39) while Group B consisted of those referred later (more than one year from diagnosis, Group B, n = 76). Our analysis showed that Group A had a higher baseline HbA1c of 9.9, compared with 8.9 for Group B. At discharge, Group A was found to have a lower HbA1c of 7.2, compared with 7.9 for Group B. This translates into a mean improvement of 2.6 and 0.9 for Group A and Group B respectively, with the difference between the 2 groups being statistically significant (p value < 0.001).

We also looked at the 24 patients who failed to return for follow-up (Group F) against the other 147 patients in our study who attended their appointments until they were discharged from the service (Group G). Patients who failed to return were found to have poorer baseline control (HbA1c of 10.1) compared with a mean of 9.0 for their counterparts, which was statistically significant (p value = 0.046). Additionally, Group F was found to have a worse mean HbA1c on repeat blood test compared to Group G (9.2 v/s 7.5, p value = 0.001). Of note, 23 and 141 patients from Groups F and G respectively had initial HbA1c measurements, while the number of patients with a repeat HbA1c was 13 and 104 respectively for the two groups. The demographics of patients who failed to return were also analysed. This showed that patients who failed to attend were generally younger (age 49 v/s 57, p value = 0.04). Interestingly, gender and linguistic background were not statistically different between Groups F and G.

Following review at our DSS clinic, patients were discharged to 3 potential destinations including the local medical officer/general practitioner, private endocrinologist and Chronic Disease Management Clinic (CDM Clinic). Improvement in HbA1c for these 3 groups were 1.8, 2.0 and 0.8 respectively, and, as expected, the CDM Clinic group consisted of cases that were more difficult to manage and showed the least improvement compared with the other 2 destinations (p value = 0.025).

Figure 4

Figure 1: Time since diagnosis versus Improvement in HbA1c achieved by DSS clinic



CARDIOPROTECTIVE MEDICATIONS

There was an increase in the number of patients prescribed ACEi/ARB and statin medication on discharge from the clinic as shown in Table 4. The introduction of antiplatelet therapy was not statistically significant.

Figure 5

Table 4. Cardioprotective drugs at baseline and at discharge

Treatment	Baseline	Discharge	P-value
• Statin	91 (53%)	109 (64%)	0.0004
• ACE-inhibitor/ARB	92 (54%)	111 (65%)	0.0004
• B-blocker	41 (24%)	42 (25%)	0.78
• Anti-platelet (aspirin or clopidogrel)	75 (44%)	80 (47%)	0.251

DISCUSSION

A number of studies have shown that a multidisciplinary approach involving a team of health professionals can improve glycaemic control. Our audit of the DSS clinic was aimed towards evaluating how a health service that incorporates various health professionals would impact on the management of diabetes.

We have shown that intervention by a multidisciplinary team in an academic diabetes centre for a short duration is effective in improving glycaemic control. The United Kingdom Prospective Diabetes Study (UKPDS) study has

shown that improvement in HbA1c is associated with a decrease in the rate of diabetes-related complications. A 1% drop in HbA1c leads to a reduction of complications by 35%, diabetes-related mortality by 25%, myocardial infarction by 18%, and all-cause death by 7% [21]. The UKPDS population took a population of newly-diagnosed patients with Type II diabetes. This differs from our population where patients with both Type I and Type II diabetes were either newly diagnosed or had longstanding diabetes.

Patients who attended the DSS clinic had a mean improvement in HbA1c of 1.5. Based on the UKPDS study this translates to a 53% reduction in complications, 38% reduction in diabetes-related mortality, 11% reduction in all-cause mortality as well as a 27% decrease in the incidence of combined fatal and nonfatal myocardial infarction.

The ten-year follow-up of the UKPDS cohort showed that following intervention, patients still enjoyed benefits of a reduced incidence of cardiovascular and microvascular complications despite an early loss in glycaemic differences [22]. This phenomenon is now commonly referred to as "metabolic memory". This would suggest that although the long-term outcomes of our patients were not evaluated in this study, it is expected that the mean reduction of HbA1c of 1.5% will confer long-term health benefits to our patients.

In addition to showing that a multidisciplinary clinic is beneficial in improving glycaemic control, our main finding was that intervention in patients with shorter duration of diabetes was a positive predictor for improvement in HbA1c after attendance at our Diabetic Support Service Clinic. This finding was statistically significant (p value = 0.011) and was consistent with former studies performed overseas, namely the Lam et al study in Hong-Kong, which showed that newly diagnosed diabetes (of duration of less than 1 year) was associated with a 'favourable glycaemic control'. [10] A possible explanation for this is that patients early in the course of their disease are likely to have greater Beta-cell function and are therefore likely to be more responsive to oral hypoglycaemic agents.

Patients who were referred early to the DSS clinic, i.e. with duration of illness of less than 1 year, showed a more favourable improvement in HbA1c. The rate of improvement, however, follows a declining curve with a longer duration since diagnosis. Of note, this pattern was no longer present for patients diagnosed over 15 years. Explanations for this could include the relatively small number of patients who had diabetes for greater than 15 years, the years preceding of poor glycaemic control and adherence to therapy.

Nevertheless, the general trend in glycaemic improvement with the time since diagnosis is very promising and strongly supports the need to intensively manage glucose control from the outset of the disease. We believe that in addition to the measurable improvement in HbA1c, this form of early intervention also enables patients to better understand their condition and empowers them to a lifelong holistic management of their condition.

Primary and secondary prevention of cardiovascular disease with cardioprotective medications is important in patients with diabetes who are at high risk. Other risk factors should also be assessed and managed. The DSS was successful in introducing some of these medications. ACE-ARB and statin therapy increased and was statistically significant. Antiplatelet therapy remained stable and therefore represents an avenue for improvement.

Our study does have certain limitations. These include it being a retrospective study, hence the inability to truly measure the actual compliance of patients to therapy. The study also had a certain degree of reliance on GPs to provide accurate past history and complications in their referral letter. Whilst detailed documentation might be limited by the retrospective nature of the study, this was minimised by the use of Proforma, which also ensured consistency of care between clinicians. The incomplete dataset from medical records might represent a potential limitation. This was addressed to some extent by the number of participants and the randomisation process.

CONCLUSION

Our study demonstrated that intervention at a multidisciplinary clinic was beneficial in improving glycaemic control in diabetic patients. Furthermore, a statistically significant link was found between the duration of diabetes at intervention and the improvement achieved. This finding is expected to be applicable to most patients with diabetes and supports the need for early intervention and using an interdisciplinary team model.

This is an example of a how a tertiary academic referral centre can support primary care to manage diabetes. This model of care could be used to manage other forms of chronic disease. With the limited number of specialists and resources that are available, this hybrid model of diabetes

management may be the solution to the ever increasing numbers of patients with diabetes.

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Author Information

Christopher FD LI WAI SUEN, MBBS (Hons)
Dandenong Hospital

Hau Choong AW, MBBS (Hons)
Dandenong Hospital

Eldho PAUL, BSc, MSc
Monash Institute of Health Services Research, School of Public Health and Preventive Medicine, Monash University

Jennifer LA WONG, MBBS (Hons), FRACP, MIH
Department of Endocrinology, Dandenong Hospital