

Effect of an intervention to improve the management of patients with diabetes in primary care practice

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ABSTRACT

الأهداف: تحديد تأثير التدخل التوعوي لأطباء الرعاية الأولية وذلك بغرض تحسين الرعاية الطبية المقدمة لمرضى السكري وطرق علاجهم.

الطريقة: أُجريت هذه الدراسة الاستطلاعية في مستشفى الملك خالد الجامعي، الرياض، المملكة العربية السعودية خلال الفترة من يناير 2008م إلى يوليو 2009م. شملت هذه الدراسة مرضى السكري الذين تم معاينتهم من قبل أطباء الرعاية الأولية، وقد تم تقسيمهم إلى مجموعتين وهما: مجموعة المرضى الذين تضمنهم التدخل التوعوي للأطباء (مجموعة التدخل)، ومجموعة المرضى الذين لم يتضمنهم هذا التدخل (مجموعة التحكم). لقد تم التدخل التوعوي بمساعدة خبير متخصص قام بالإشراف على قائمة الفحوصات السريرية والكيميائية الحيوية التي لا بد من إجرائها للمريض من قبل الطبيب المعالج ومن ثم إدخال البيانات إلى الحاسوب وذلك وفقاً للدليل لعلاج مرضى السكري المبني على البراهين. تقدم هذه القائمة فيما بعد للطبيب المعالج للاستشارة به، أما في مجموعة التحكم، فلم يتم الاستعانة بالخبير المساعد. وبعد انتهاء عام الدراسة قام شخص محايد بمراجعة ملفات المرضى لكلي المجموعتين للتأكد من مدى الالتزام بدليل علاج مرض السكري.

النتائج: لقد كان عدد المرضى في مجموعة التدخل التوعوي 517 مريضاً، وكان عددهم في مجموعة التحكم 162 مريضاً. أظهرت نتائج الدراسة بأن التدخل قد قام بتحسين نسبة الكشف عن مضاعفات السكري على النحو الآتي: اعتلال الشبكية من 24.7% إلى 98.5%، اعتلال الأعصاب من 25.9% إلى 92%، واعتلال الكلى من 37.8% إلى 73.7%. ولم يحدث تحسن في مستوى سكر الدم لدى أي من المجموعتين، كما كانت نتائج تحليل الهيموغلوبين الغليكوزيلاتي أعلى من 7%.

خاتمة: أشارت الدراسة إلى أن علاج مرضى السكري في عيادات الرعاية الأولية هو أقل من المستوى المطلوب. ويعد التدخل الذي أجريناه في هذه الدراسة فعالاً في تعزيز الالتزام بدليل علاج مرضى السكري المبني على البراهين.

Objectives: To assess the effect of an intervention targeted at primary care physicians (PCPs) in order to improve their management of diabetic patients.

Methods: Diabetic patients seen by PCPs in King Khalid University Hospital, Riyadh, Kingdom of Saudi Arabia from January 2008 to July 2009

were included in this prospective cohort study. The PCPs were divided into intervention and control groups. The intervention group with the help of an assistant, utilized a customized designed computer program generating a checklist for the PCPs. The list included clinical and biochemical screening tests needed for the patient's current visit, according to evidence-based diabetes guidelines. For the control group, no assistant was used. At the end of one year, an independent reviewer evaluated the patients' files in both groups to assess the adherence to diabetes guidelines.

Results: We enrolled 162 patients in the control group and 517 patients in the intervention group. The intervention significantly improved the percentage of patients being screened for diabetic complications; retinopathy from 24.7-98.5%, neuropathy from 25.9-92%, and nephropathy from 37.8-73.7%. There was no improvement in glycemic control in both groups and glycosylated hemoglobin level (HbA1c) values were still above the 7% target.

Conclusion: Management of diabetic patients in the primary care clinics is below standard. The intervention applied was effective in promoting better adherence to evidence-based diabetes guidelines.

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Diabetes mellitus is a common chronic disease that requires continuous medical care to reduce the risk of its complications. It is a major cause of coronary artery disease, one of the leading causes of death, and a leading cause of new cases of blindness and kidney disease in adults.^{1,2} Intensive treatment of diabetes reduces the risk of its complications, and more aggressive screening strategies allow earlier detection and management of these complications. Diabetes is costly both to the affected person and to society. The World Health Organization estimates that as of November 2009, more than 220 million people have diabetes worldwide and that the mortality from diabetes in 2005 was over 1.1 million people.³ Saudi Arabia has an alarming prevalence of diabetes according to a national epidemiologic survey carried out in 2004.⁴ A review study was carried out showing a high incidence of diabetes complications in the Saudi population.⁵ Although the actual cost of diabetes in Saudi Arabia remains unknown, data from the United States suggest that diabetes and its management consume approximately 1 in 10 health care dollars. These high costs, in addition to economic analyses showing that early interventions are cost-effective, emphasize the importance of the appropriate management of diabetes to society as a whole.⁶ Currently 75-95% of patients with type 2 diabetes are treated by physicians in a primary health care setting.⁷⁻¹⁰ However, several studies have shown that diabetic management, including screening for diabetes complications, by health care providers does not meet the standards of care.¹¹⁻¹³ Strict targets for glycemic, blood pressure and lipid control are often not achieved.¹⁰ Less than 12% of diagnosed patients reach treatment goals for blood glucose, cholesterol, and blood pressure.⁹ Although there are many reasons for this, perhaps the most important one is the fact that our current systems of diabetes care make outstanding management for diabetes difficult, if not impossible. Patients with diabetes are complex, often do not take the best care of themselves, require multiple medications, and may require follow-up between visits. For a primary care physician (PCP) who may be allowed 10 to 15 minutes to see one patient, it is difficult to provide the standards of diabetes care. A large number of diabetic patients in the Kingdom of Saudi Arabia also receive their medical care from PCPs. This raises the interest in assessing the PCPs' practice, behaviors, and attitudes for managing patients with diabetes, and whether they could implement an intervention to improve the care that they provide to the diabetic patients. Diabetic management and screening for its related complications were previously assessed in a primary care clinic (PCC) at King Khalid University Hospital (KKUH) in Riyadh from 2001 to 2003, and compared to the American Diabetes Association (ADA) clinical practice guidelines.¹⁴ In a

retrospective study of 99 type 2 diabetic patients, only 24.7% achieved the recommended glycemic control of glycosylated hemoglobin level (HbA1c) ≤ 7 during the 3-year follow-up. The HbA1c was requested according to the guidelines in only 30% of patients. The evaluation for diabetic neuropathy was well below the standards of care since only 34% of patients had annual detailed foot examination. Moreover, only 16% of patients had their urine tested annually for the presence of proteinuria.

Based on these data, the aim of this study was to determine whether the implementation of an intervention, with the use of an assistant, will influence the physicians' behavior, patients' management, and adherence to the clinical practice guidelines; as well as improve patients' outcome.

Methods. Diabetic patients seen by the PCPs of KKUH in Riyadh, Kingdom of Saudi Arabia from January 2008 to July 2009, were recruited and followed-up for one year. Recruited diabetic patients were those with type 2 diabetes, or type 1 diabetes for at least 5 years. Patients were regularly seen at the Primary Care PCC at 3-4 months intervals. Those who were simultaneously followed in the endocrine clinic were not included in this study. Consent was obtained from all participants and the study was approved by the KKUH ethics board. Only patients in the PCC were included. Demographic, clinical, and laboratory data were collected from the patients' charts. The PCPs were divided into 2 groups, the intervention group using an assistant, and the control group without assistant. For ease of classification and to prevent cross contamination of PCPs, the PCPs of the PCC male division were assigned as the intervention group, and the PCPs of the PCC female division as the control group. The PCPs remained in the same group throughout the course of the study. The assistant is a health care professional with a medical degree, who reviewed the patients' files daily, before the PCPs see the patients. The patients' recent lab results, current management and procedures completed were all noted. The clinical and biochemical information was entered into a specially designed computer program, which generated a checklist of the clinical and biochemical screening tests that should be carried out in the current patient's visit according to evidence-based diabetes guidelines. The checklist was inserted in the patients' files for the PCPs to review and follow up. The items in the list already carried

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out were checked while those not yet carried out were highlighted for emphasis. For the control group, no assistant was used. After a year of follow-up, patients' charts were reviewed by an independent reviewer and an assessment was made on the difference in proportion of the intervention and control groups conforming to the evidence-based guidelines in the management of diabetes.

Data were analyzed using the Statistical Package for Social Sciences version 12.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics (mean, standard deviation, and proportions) were used to summarize the outcome variables. Paired t-test was carried out for the difference of the means of the variables between the baseline

and the final value for both groups. Fisher's exact test was carried out in determining the compliance to the evidence-based guidelines between the 2 groups. The confidence interval was set at 95%.

Results. A total of 679 patients with diabetes were recruited, 517 in the intervention group and 162 in the control group. The characteristics of the patients are given in Table 1. Of note, both groups were comparable in terms of age and BMI. Most of our study group was either overweight or obese. The adherence to the ADA guidelines for the blood pressure measurements, HbA1c, serum lipids, and for the screening of diabetes complications are shown in Table 2. Both groups had their blood pressure and HbA1c checked according to guidelines. Although almost all patients had their serum total cholesterol and triglycerides checked, complete cholesterol profile (which includes low density lipoprotein cholesterol) was carried out in only 44% of patients in the control group and increased significantly to 56% in the intervention group. The intervention did significantly improve the screening for diabetic retinopathy (from 24.7-98.5%), neuropathy (from 25.9-92%), and nephropathy (from 37.8-73.7%). The HbA1c, serum triglycerides, and serum cholesterol for both groups were noted at baseline and after one year of follow up (Table 3). There was no improvement in

Table 1 - Characteristics of patients in each group (n=679).

Variables	With assistant	Without assistant
	Mean \pm SD	
Age (years)	56.54 \pm 11.63	56.22 \pm 10.47
Weight (kg)	83.7 \pm 14.94	76.92 \pm 15.53
Height (m)	166.52 \pm 6.12	150.71 \pm 5.49
BMI (kg/m ²)	30.23 \pm 6.45	33.06 \pm 6.2
Male	517	-
Female	-	162

BMI - body mass index

Table 2 - Number of patients examined according to American Diabetic Association (ADA) guidelines parameters.

ADA parameters	With assistant	Without assistant	P-value
	n (%)		
BP measurement ¹	507 (98.1)	160 (98.8)	0.49
HbA1c ²	495 (95.7)	154 (95.1)	0.67
Triglycerides / cholesterol ³	517 (100)	161 (99.4)	0.24
Complete lipid profile ³	288 (55.7)	71 (43.8)	0.01
Detailed eye exam ³	509 (98.5)	40 (24.7)	0.0001
Well documented foot examination ³	476 (92.1)	42 (25.9)	0.0001
Assessment of nephropathy (24-hr urine) ³	381 (73.7)	61 (37.8)	0.0001

¹every visit, ²2 times a year, ³once a year, BP - blood pressure, HbA1c - glycosylated hemoglobin level

Table 3 - Laboratory parameters of diabetic outcome.

Laboratory parameter	With assistant group		P-value	Without assistant group		P-value
	Baseline Mean \pm SD	Final Mean \pm SD		Baseline Mean \pm SD	Final Mean \pm SD	
	(n)			(n)		
HbA1c	7.70 \pm 1.68 (320)	7.65 \pm 1.50 (436)	0.83	7.74 \pm 1.50 (136)	7.84 \pm 1.50 (134)	0.67
Serum triglycerides	1.81 \pm 1.16 (498)	1.74 \pm 1.18 (496)	0.24	1.71 \pm 0.86 (124)	1.72 \pm 1.05 (155)	0.84
Serum cholesterol	4.46 \pm 1.04 (499)	4.22 \pm 0.93 (496)	0.00	4.69 \pm 0.88 (124)	4.44 \pm 0.96 (155)	0.00

n - number of patients, HbA1c - glycosylated hemoglobin level

the glycemic control in both groups and HbA1c values were still above the 7% target. Serum cholesterol, but not serum triglycerides, was significantly lower in both groups after the follow up period.

Discussion. Increasing evidence that good glycemic control can significantly reduce diabetes complications makes it a physician's imperative to aggressively treat their diabetic patients. Targeted screening for diabetes-related complications help in its early detection and treatment, which can markedly reduce diabetes-related morbidity and mortality. The effect of intensive treatment of diabetes on the development and progression of long term complications in insulin-dependent diabetes has been studied by the Diabetes Control and Complication Trial Research Group. This was a prospective randomized multicenter study with primary endpoints of microvascular and macrovascular complications. Aggressive diabetes control with intensive insulin therapy was compared to conventional therapy. Intensive insulin therapy reduced the mean risk for developing retinopathy by more than 50%, reduced microalbuminuria by 39%, proteinuria by 54% and neuropathy by 60%.¹⁵ The UK Prospective Diabetes Study Group is another randomized multicenter clinical trial that was designed to establish in type 2 diabetic patients whether the risk of microvascular or macrovascular complications could be reduced by intensive blood glucose control with oral hypoglycemic agents or insulin. Results showed that intensive diabetes control to achieve mean HbA1c levels of 7% resulted in a significant reduction of microvascular complications. Intensive hypertension therapy showed a beneficial effect on microvascular and macrovascular outcomes, in comparison with lesser control.¹⁶⁻¹⁸

Patients diagnosed with diabetes should be screened for diabetes related health problems as recommended by evidence-based guidelines, for example, the American and the Canadian Diabetes Associations guidelines.^{19,20} Our findings of low adherence to evidence-based diabetes guidelines are similar to several other studies carried out worldwide. It has been shown that physicians caring for patients with diabetes do not adequately address diabetes-related healthcare screening.^{21,22} Individual physicians may find patients with diabetes difficult to manage because of the number of diabetes-related screenings that need to be performed on a regular basis. Several interventions have been reported aiming at improving the provision of diabetes care and achieving better metabolic control for patients with diabetes.²³ An online database review carried out by Renders et al²⁴ assessing the effects of different interventions targeted at health professionals on patient management in the primary care setting, shows that multifaceted professional interventions can enhance

the performance of health professionals in managing patients with diabetes.²⁴ Improving the behavior of health care providers in implementing given guidelines is possible through periodic process audits and feedbacks, as concluded by Al-Hussein.²⁵ Furthermore, clinical practice guidelines can be of help to physicians by promoting a change in their behavior. In a study by Nuckolls,²⁶ guidelines were corrected to a real-time reminder protocols (at the time the physician is making clinical decisions with the patients), and it was observed that the compliance with recommended tests and procedures were increased, management of conditions improved, and complications were reduced.²⁶

In Saudi Arabia, Azab²⁷ has assessed the glycemic control among diabetic patients attending PHCC's in Riyadh. The author concluded that diabetes is poorly controlled in a large proportion of these patients. However, his study did not assess other factors in diabetes management such as screening for diabetes complications.

In our study, adherence of PCPs with the screening for diabetes complications guidelines were carefully analyzed. The screening for retinopathy, neuropathy, and nephropathy were well below the recommended levels. The intervention we used did significantly improve the percentage of patients being screened for diabetes complications; retinopathy from 24.7% to 98.5%, neuropathy from 25.9% to 92%, and nephropathy from 37.8% to 73.7%. This is a very significant finding as only 30-69% of diabetic patients are usually referred to an eye clinic.^{28,29} The intervention we implemented also significantly improved the rate of annual foot examination, and screening for proteinuria to a higher level than what had been previously published.^{30,31} There was no improvement in the glycemic control in both groups and HbA1c values were still above the 7% target. A similar study by Hahn et al³² also revealed no attainment of outcome targets for HbA1c, cholesterol and blood pressure in spite of using diabetes flow sheets as an intervention to improve patients' care.³² The short study duration could be the reason why the glycemic control was not up to target. More studies are needed to explore the factors responsible for this suboptimal management. While measures have been implemented to minimize cross contamination between the 2 groups, PCP's in the control group were aware of the study and hence may have ordered more tests than they usually do. However, this will even make the results of our study more impressive. Even with the PCPs in the control group ordering more tests than they usually do, there was still significant difference between the 2 groups. Another limitation of the current study is patients' grouping. Controls comprised of females and the intervention group of males. In our institute, patients are seen in different PCCs based on gender. Avoiding

cross contamination between both groups was the main reason for this classification. Given that the patients baseline characteristics are comparable in both groups and based on our previously published data from the same institute,¹⁴ we do not think that this classification affected our findings.

In conclusion, management of diabetic patients in the PCC is still below standard. The intervention we used did significantly improve the screening of diabetic complications namely, retinopathy, nephropathy, neuropathy, and lipid profile, hence, it can be utilized to promote better adherence to evidence-based diabetes guidelines.

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