Physician Adherence to the SEMT Guidelines for the Management of Type 2 Diabetes in Turkey: ADMIRE Study

Tip 2 Diyabet Tedavisinde Hekimlerin Klavuzlara Uyumu: ADMIRE Çalışması

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***See Appendix

Abstract

Objective: To evaluate the impact of physicians' adherence to the guidelines developed by the Diabetes Study Group of The Society of Endocrinology and Metabolism of Turkey (SEMT) on glycemic control in diabetes mellitus.

Materials and Methods: This was a multi-center, retrospective, and non-interventional study. The medical records of 1.790 patients with type 2 diabetes followed by 180 physicians during the last 12 months were reviewed. Adherence of physicians to the SEMT guidelines was scored between 0-10 (0 for non-adherence, 10 for full adherence).

Results: Follow-up procedures were ≥75% in adherence to the guidelines in 52% of patients. Medical history was taken in full adherence to the guidelines for 69.8% of patients, but physical examination was in full adherence only for 8.3% of patients. The degree of guideline adherence for physical examination was inversely correlated with glycated hemoglobin A1c (A1C), fasting blood glucose (FBG), and 2-hour postprandial blood glucose (PPBG) levels. The minimum levels of A1C, FBG, and PPBG were significantly associated with the degree of general adherence to the guidelines ($P<0.05$).

Conclusions: Physician adherence to the SEMT guidelines is suboptimal. Training of physicians would increase their adherence providing standardization of care and improving patients' outcome. *Turk Jem 2010; 14: 66-72*

Key words: Diabetes Mellitus; guideline adherence; physicians; drug therapy; diabetes management

Özet

Amaç: Hekimlerin Türkiye Endokrinoloji ve Metabolizma Derneği (TEMD) bünyesindeki ADMIRE Çalışma Grubu tarafından oluşturulan kılavuzlara uyumunun tip 2 diyabet hastalarının glisemik kontrol derecesi üzerindeki etkisini belirlemek.

Gereç ve Yöntemler: Bu çok merkezli, retrospektif ve müdehalesiz çalışmada toplam 180 hekim tarafından izlenmiş olan 1790 tip 2 diyabet hastasının kayıtları gözden geçirildi. Hekimlerin TEMD kılavuzlarına uyumu 0 ila 10 arasında puanlandı (0=uyumsuzluk, 10=tam uyum).

Bulgular: Hastaların %52'sinin izlemindeki uygulamalarda kılavuzlara uyum oranı %75 idi. Hastaların %69,8'inde tıbbi öykü sorgulama kılavuzlara tam uyum gösterirken, fizik muayenede bu oran sadece %8,3'tü. Fizik muayenede kılavuza uyum derecesi glikozillenmiş hemoglobin A1c (A1C), açlık kan glukoz (AKG) ve tokluk kan glukoz (TKG) düzeyleri ile ters ilişkiliydi. Kılavuzlara genel uyum derecesi ile A1C, AKG ve TKG'nin minimum değerleri arasında anlamlı derecede ilişki vardı ($p<0,05$).

Sonuç: Hekimlerin TEMD kılavuzlarına uyumu yetersizdir. Hekimlere eğitim verilmesi kılavuzlara uyumlarını artıracak ve böylece tedavide standardizasyon ve hastaların klinik seyirlerinde düzelme sağlayacaktır. *Türk Jem 2010; 14: 66-72*

Anahtar kelimeler: Diabetes mellitus; kılavuza uyum; hekimler; ilaç tedavisi; diyabetin yönetimi

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Introduction

Type 2 diabetes is a major epidemic worldwide that causes serious macrovascular and microvascular complications, and decreases the life expectancy. The number of adults with diabetes worldwide is predicted to increase from 285 million in 2009 to 438 million in 2030 (1). According to the Turkish Diabetes Epidemiology Study (TURDEP), the prevalence of type 2 diabetes is 7.2% and the prevalence of impaired glucose tolerance is 6.7% in the Turkish population ≥20 years of age (2). The population of diabetes patients in Turkey is expected to reach 3.7 million by 2010 (1) and to 6.4 million by 2030 (3).

Guidelines for the management of diabetes provide standardization of care and treatment, and improve patient outcome; thus, they should be the mainstay of approach to diabetes in clinical practice to provide optimum glycemic control and to decrease the rate of complications. There are both international and national clinical practice guidelines for the management of diabetes, the most well-known being the guidelines prepared by the American Diabetes Association. As national practice guidelines have particular importance to address local requirements, clinical practice guidelines on diabetes have been developed in 2006 by the Diabetes Study Group of the Society of Endocrinology and Metabolism of Turkey (SEMT) and are reviewed annually (4).

Although it is well known that the morbidity and mortality from diabetes can be prevented by strict application of guidelines, physician adherence to diabetes guidelines is suboptimal (5-8) and only 20-30% of patients reach the treatment targets (9,10).

In this study, we aimed to determine the physicians' adherence to the SEMT guidelines and the effect of adherence to guidelines on the degree of glycemic control in type 2 diabetes patients.

Materials and Methods

The study entitled "Adherence of physicians to guidelines for the management of type 2 diabetes: ADMIRE study" was designed as a national, multi-center and non-interventional study with retrospective and prospective phases. The retrospective phase aimed to determine the current clinical practice pattern of physicians regarding adherence to guidelines. The prospective phase includes education on the basis of data obtained from the retrospective phase and evaluation of the change in physicians' adherence to the SEMT guidelines with education. This report presents the results of the retrospective phase of the ADMIRE study. In this phase, data on the adherence of physicians to the SEMT guidelines were collected. Two hundred physicians were randomly selected from the list of specialists in Internal Medicine or Family Medicine from private clinics and state hospitals. Of these physicians, 180 were accepted to take part in the ADMIRE Study Group. Physicians have been chosen from 51 randomly selected cities out of 81 cities from all geographical regions (Northern, Southern, Western, Eastern, and Central) of Turkey, and also in accordance with the distribution of several work levels such as non-academic state (68%), private healthcare organizations (26%) and university hospitals (6%). At the end, the study group consisted of 180 physicians involved in the medical care of patients with type 2 diabetes in different healthcare centers.

The physicians were asked to make alist of type 2 diabetes patients followed in their clinic for at least 12 months over the last year. Among these patients, medical records of 10 patients determined by going backward from the latest patient followed before study initiation visit were included in the study. This report depends on the analysis of 6,032 visits of 1,790 patients older than 18 years, diagnosed with type 2 diabetes and who had follow-up records at least for the past 12 months. The focus of evaluation of medical records was to determine whether the patients were followed and treated according to the SEMT guidelines.

The guideline adherence for each item of follow-up and treatment was scored as 0 (non-adherence) or 1-2 (full adherence) to reach a total adherence score of 0-10 (0 corresponds to non-adherence and 10 corresponds to full adherence to guidelines) for each dimension of adherence (taking medical history, physical examination and laboratory evaluation). The overall adherence score was calculated by multiplying the arithmetic mean of the level of adherence for medical history, physical examination, and laboratory evaluation by 10 and change between 0-100.

The glycemic control parameters were glycated hemoglobin A_{1c} (A1C) ≤6.5%, fasting blood glucose (FBG) levels 70-120 mg/dl, and 2-hour postprandial blood glucose (PPBG) levels <140 mg/dl.

Statistical Analysis

Study data was presented using descriptive statistics. Subgroups formed according to the level of physicians' adherence to the guidelines were compared for the level of glycemic control with the chi-square test or Mantel-Haenszel chi-square test for proportions of patients at target and one-way ANOVA for the mean levels of numerical variables. Comparison of proportions between visits was performed by the McNemar test. The Spearman's simple-correlation coefficients (r) were calculated for the relationship between degree of adherence to the SEMT guidelines and levels of A1C, FBG, and PPBG. Additionally, univariate linear regression models were built to estimate A1C, FBG and PPBG by physical examination adherence score. Statistical significance was assigned to P values less than 0.05. Physical and laboratory variables are given as "mean ± standard deviation".

Results

Study Population

The mean age of 1.790 patients followed during the last year was 58.7±10.9 years and 62% of them were women. The mean duration of diabetes was 7.7±7.5 years. The majority of patients (95.8%) were under pharmacotherapy for diabetes (61% with oral anti-diabetic drugs (OAD), 15% with insulin, and 20% with OAD+insulin). Of these patients, 20.5% had two, 12.6% had three, and 64.2% had 4 or more control visits during the previous year.

A total of 24.2% of patients had at least one acute complication of diabetes within the previous year; hypoglycemia was the most common (19%) followed by ketoacidosis (4.6%) and hyperosmolar hyperglycemic state (4.0%). Within the previous year, 89.5% of patients were evaluated for the presence of chronic complications and 58.6% of them had at least one chronic complication. More than one-fourth of the patients (26.2%) had chronic complication in one system, 16.9% in two, and 15.4% in more than two systems. The most frequent chronic complication was neuropathy (40.0%)

followed by cardiovascular complications (29.3%), retinopathy (24.2%), and nephropathy (12.2%).

Level of Glycemic Control

The percentages of patients reaching the target A1C, FBG, and PPBG were 15.6%, 14.5%, and 10.0%, respectively at the first visit and increased to 23.4%, 28.8%, and 16.7%, respectively, at the last visit (Figure 1).

The rate of patients with target level of glycemic control was higher in patients with high number of0 follow-up visits in the previous year (P=0.049 for A1C, P=0.030 for FBG), short duration of diabetes (P=0.038 for A1C, P=0.013 for PPBG), no chronic complication (P=0.002 for A1C, P=0.049 for PPBG), who have reached the target triglycerides level (P=0.046 for A1C, P<0.001 for both FBG and PPBG), and were treated with OAD (P<0.001 for A1C).

Physicians' Adherence to the SEMT Guidelines

The overall adherence to the SEMT guidelines was 71.3±21.0%. For 52% of patients, follow-up procedures were 75% or over in adherence to the SEMT guidelines; for 14.5% of patients, the adherence was below 50% and for 33.4%, the adherence was between 50-75%. The mean scores for adherence to the guidelines were 8.9±2.2, 5.9±3.0, and 6.6±2.8, corresponding to clinical practices regarding medical history, physical examination, and laboratory evaluation, respectively.

The rate of full adherence to the SEMT guidelines for taking medical history was 69.8% in any visit within the previous year. In only 8.3% of patients, physical examination was performed in full adherence to the SEMT guidelines at least once. Among physical examination parameters, the adherence to the guidelines was highest for blood pressure (BP) measurement (89%). However, the adherence was just above the average for measurements of weight (60%) and height (52%). Waist circumference was measured only in 26% of patients in accordance with the guidelines.

Impact of Guideline Adherence on Glycemic Control

The degree of overall adherence to the guidelines (as <50%, 50–75%, >75%) did not affect the rate of patients who were under glycemic control for all glycemic control parameters (for A1C: P=0.56, P=0.70, P=0.70 and P=0.087; for FBG: P=0.67, P=0.25, P=0.35 and P=0.92; and for PPBG: P=0.55, P=0.14, P=0.097 and P=0.28, respectively for visits 1, 2, 3 and 4) (Figure 2). The degree of adherence to the SEMT guidelines for taking medical history on symptoms of diabetes and chronic complicationsas well as for BP measurement had no significant effect on the percentage of

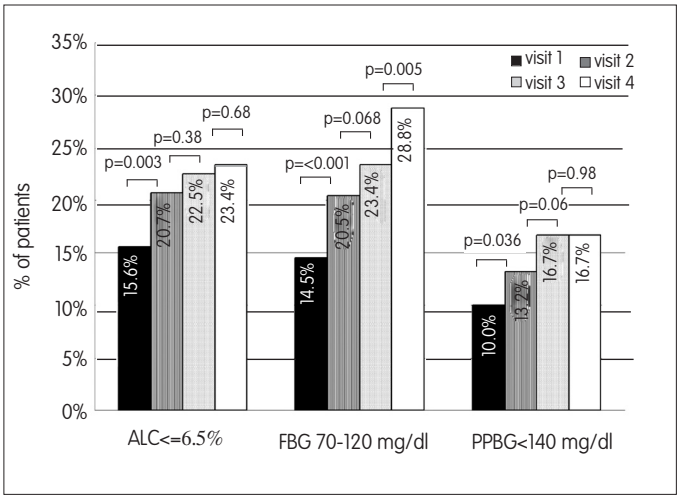

Figure 1. Percentage of patients on target levels of glycemic control parameters in each follow-up visit during the previous year. A1C: Glycated hemoglobin A1c, FBG: Fasting blood glucose, PPBG: Postprandial blood glucose. P values are calculated by McNemar test

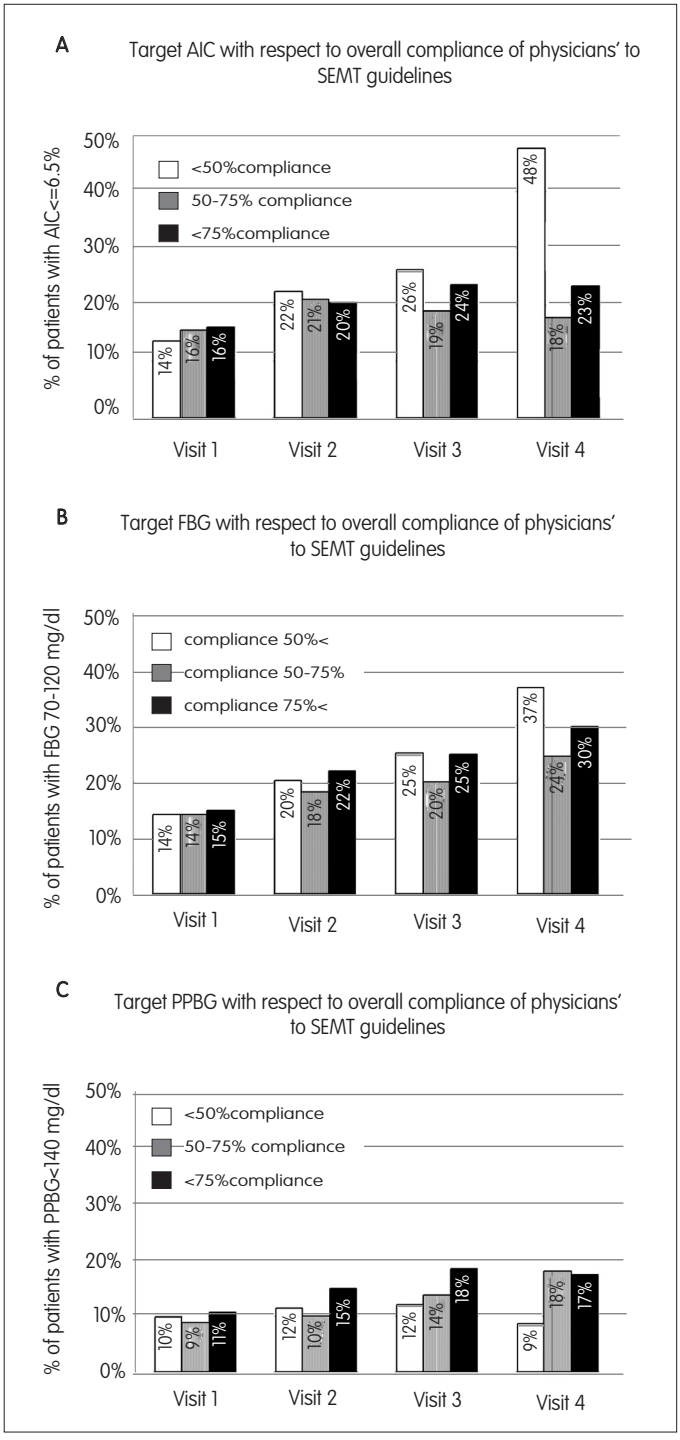

Figure 2. Percentage of patients reaching target glycated hemoglobin A1c (A1C), fasting blood glucose (FBG), and postprandial blood glucose (PPBG) with respect to overall adherence to SEMT guidelines (<50%, 50–75%, >75%). No statistically significant difference was found between different adherence levels for each glycemic control parameter (P>0.05)

patients with glycemic control (P>0.05 for all comparisons; see Table for exact P values) (Table 1).

On the other hand, in correlation analysis between degree of adherence to the SEMT guidelines and levels of A1C, FBG, and PPBG, a weak inverse correlation was observed between physical examination adherence score and A1C (r=-0.076, P=0.01), FBG (r=-0.077, P=0.002) and PPBG levels (r=-0.068, P=0.041). When univariate linear regression models were built to estimate A1C, FBG and PPBG by physical examination adherence score, corresponding regression coefficients were found to be -0.045%, -1.31 mg/dl and -2.20 mg/dl per one point increase in physical examination adherence score. This means that when compared with non-adherence (score=0), full adherence (score=10) induces 0.45%, 13.1 mg/dl and 22.0 mg/dl decreases in A1C, FBG and PPBG, respectively (Table 2).

The minimum levels of A1C, FBG and PPBG reached within the previous year were significantly associated with the degree of general adherence to the guidelines (Table 3). The minimum A1C

Table 1. The percentage of patients reaching glycemic control targets with respect to adherence to guidelines for medical history (questioning of symptoms of diabetes and chronic complications) and blood pressure measurement. P values are calculated by chi-square test

	Questioning of symptoms of diabetes			Questioning of chronic complications			BP measurement		
	Non-A	Full A	p value	Non-A	Full A	p value	Non-A	Full A	p value
Visit 1									
A1C ≤6.5%	18.4%	15.5%	0.60	21.6%	15.1%	0.087	15.7%	15.7%	0.99
FBG 70-120 mg/dl	19.3%	14.2%	0.18	20.5%	13.9%	0.025	18.5%	14.2%	0.14
PPBG <140 mg/dl	10.6%	10.0%	0.88	11.1%	9.9%	0.76	15.3%	9.4%	0.11
Visit 2									
A1C ≤6.5%	12.5%	21.2%	0.18	27.6%	20.2%	0.18	27.8%	19.9%	0.16
FBG 70-120 mg/dl	25.4%	20.2%	0.32	26.2%	20.0%	0.13	23.8%	20.7%	0.48
PPBG <140 mg/dl	12.0%	13.3%	0.85	14.0%	13.2%	0.87	14.3%	13.4%	0.87
Visit 3									
A1C ≤6.5%	16.7%	22.8%	0.48	18.0%	22.8%	0.43	22.0%	22.1%	0.98
FBG 70-120 mg/dl	27.3%	23.2%	0.45	32.4%	22.6%	0.021	27.1%	23.4%	0.39
PPBG <140 mg/dl	11.1%	16.8%	0.52	14.6%	16.9%	0.68	19.0%	16.8%	0.71
Visit 4									
A1C ≤6.5%	33.3%	23.1%	0.36	30.8%	23.0%	0.26	28.1%	21.8%	0.40
FBG 70-120 mg/dl	33.3%	28.6%	0.57	43.9%	27.5%	0.005	25.0%	29.3%	0.50
PPBG <140 mg/dl	18.8%	16.7%	0.83	15.0%	16.8%	0.76	16.7%	17.1%	0.95

BP: Blood pressure; Non A: Non-adherence to guidelines; Full A: Full adherence to guidelines; A1C: Glycated hemoglobin A1c; FBG: Fasting blood glucose; PPBG: post-prandial blood glucose

Table 2. Correlation coefficients (r) between degree of adherence to SEMT guidelines and the levels of A1C, FBG, and PPBG. Data are presented as Spearman's r and (p values)

Adherence to guidelines	A1C level	FBG level	PPBG level
Taking medical history	-0.031 (0.29)	-0.004 (0.88)	-0.026 (0.44)
Physical examination	-0.076 (0.010)	-0.077 (0.002)	-0.068 (0.041)
Laboratory evaluation	-0.006 (0.83)	-0.011 (0.65)	-0.017 (0.62)
Overall adherence	-0.051 (0.079)	-0.053 (0.034)	-0.052 (0.12)

A1C: Glycated hemoglobin A1c; FBG: Fasting blood glucose, PPBG: 2-hour postprandial blood glucose

Table 3. The relation between the degree of general adherence to SEMT guidelines and minimum and maximum levels of A1C, FBG, and PPBG during previous year. P values are calculated by one-way ANOVA

	Overall adherence to SEMT guidelines			
	<50%	50–75%	>75%	p value
A1C (%)				
Minimum	7.7±1.9	7.7±1.8	7.4±1.8	0.009
Maximum	8.6±2.1	8.7±2.0	8.8±2.1	0.44
FBG (mg/dl)				
Minimum	154.0±63.5	150.7±62.1	139.5±51.5	<0.001
Maximum	201.7±83.5	210.6±83.5	209.2±85.1	0.42
PPBG (mg/dl)				
Minimum	203.9±88.3	196.0±72.0	181.3±69.2	<0.001
Maximum	247.2±92.1	247.1±89.3	250.5±90.2	0.82

A1C: Glycated hemoglobin A1c; FBG: Fasting blood glucose, PPBG: 2-hour postprandial blood glucose

was 7.7±1.9% and 7.4±1.8% in patients with adherence score <50% and >75%, respectively (P=0.009). The minimum FBG was 154.0±63.5 mg/dl and 150.7±62.1 mg/dl in patients with adherence score <50% and 50-75%, but decreased to 139.5±51.5 mg/dl with adherence score >75% (P<0.001). The minimum PPBG was 203.9±88.3 mg/dl and 196.0±72.0 mg/dl in patients with adherence score <50% and 50-75%, but decreased to 181.3±69.2 mg/dl with adherence score >75% (P<0.001; Table 3).

Conclusion

The results of this retrospective analysis supported the previous reports that underlined the suboptimal adherence to guidelines and its effects on glycemic control (5-8).

Our findings showed that the overall physician adherence to the SEMT guidelines in Turkey is not sufficient (71% over 100%). Although practices of taking medical history in diabetes patients were found to be quite well and in consistence with the guidelines, the proportions of patients evaluated with full adherence regarding physical examination were very low.

Although adherence scores and degree of overall guideline adherence did not affect the rate of patients who were under glycemic control, physical examination adherence score was found to be weakly and inversely correlated with the levels of A1C, FBG, and PPBG. According to univariate linear regression analysis, physicians' full-adherence to physical examination guidelines improves A1C, FBG and PPBG by 0.45%, 13.1 mg/dl and 22.0 mg/dl, respectively. This much improvement in glycemic control may translate into significant clinical effect by preventing or delaying the development of long-term diabetic complications. Therefore, though the correlation coefficients were too low to speak about, when the degree of relationship with physical examination adherence score and A1C, FBG and PPBG are taken into account, the effect of adherence to physical examination seems to be of importance. Glycemic control is better maintained with increasing the overall guideline adherence.

It was also found that factors affecting glycemic control were the number of follow-up visits, duration of diabetes, presence and number of chronic complications, being on target triglycerides levels, and therapy with OAD.

Diabetes is associated with a significantly increased risk of mortality, predominantly from cardiovascular complications (11). As a result of the progressive nature of diabetes, glycemic control deteriorates with time, and the risk of associated complications increases. Intensive treatment of glycemia, BP, and serum lipids has been shown to delay the onset and progression of complications in type 1 and type 2 diabetes (12-14).

As confirmed with the results of this study, the adherence to local guidelines is suboptimal among the Turkish physicians as well. In general, the reasons of this suboptimal adherence can be clustered in three main groups: patient-related factors, physician-related factors, and systemic factors (5,6,8,10,15-18).

Patient-related factors are reduced adherence to prescribed medications and inadequate counseling of patients about the benefits of diabetes treatment. Lack of education, resistance to life style changes, regional factors (e.g. socioeconomic variability among geographical regions of Turkey) can also be included in patient-related factors.

Physician-related factors include physician workload, perception of diabetes to be the hardest-to-manage chronic disease, complexity of treatment plan, time and cost issues, lack of confidence in clinical skills, ignorance of or disagreement with the guidelines.

Systemic factors include performance-dependent reimbursement models that favor symptom-based care and procedural interventions as opposed to preventive care and educational interventions, lack of resources for patient and clinician training, insufficient quality and documentation in practice settings and absence of organizational systems to support diabetes management.

The International Diabetes Mellitus Practice Study (IDMPS), a survey documenting type 1 and type 2 diabetes treatment practices in developing regions worldwide including Turkey was published recently (10). A total of 939 type 2 diabetes patients were recruited to the IDMPS from Turkey by 94 physicians specialized in diabetes. Among type 2 diabetes patients, 36% never had A1C measured, 10-40% were not screened for complications in the last two years, and only 20-30% were at target for A1C (<7%). Similarly, 15.6% of patients in our study reached the target A1C, which is <6.5%. IDMPS also indicated that there is a misperception of physicians about patients' glycemic control (10). Many physicians noted adequate glycemic control despite nonavailability of A1C measurements, whereas others overestimated the proportions of patients at goal.

There are structured intervention programs shown to improve the adherence to guidelines such as phone calls, automated voice messaging system, computer-supported diabetes management programs, group visits, development of local consensus guidelines, feedback on performance, practice aids, patient and physician education sessions, patient counseling and decreasing the waiting times (19-22). Significant positive correlation is found between various structured intervention programs and improvement in the control and treatment of diabetes. Moreover, adherence to these guidelines is also associated with improved financial outcomes (23). Also, patients who were treated as recommended in practice guidelines were reported to be more satisfied with their care (24). This finding may be used to encourage physicians to adhere to guidelines.

However, it must be kept in mind that the achievement of target scores is dependent not only on processes of care, but is also influenced by other factors such as disease duration and severity, type of treatment, physicians' ability to identify patients whose targets are not achieved, and overall physician-patient relationship.

Clinical guidelines, by standardizing the approach to well-defined clinical situations, facilitate the management of patients with type 2 diabetes. These guidelines also may eliminate unnecessary variance between medical practices and thus, prevent errors of omission and commission. The clinical guidelines also serve to decrease the cost of care (25).

We suggest that specific training of physicians on the SEMT guidelines would increase the level of adherence to the guidelines during their clinical practice providing standardization of care and improving patient outcome. Accordingly, the prospective phase of the ADMIRE study, which includes such an education program on the basis of the findings of the present report and post-education reassessment of physicians' adherence to the SEMT guidelines, has been put into practice.

In conclusion, the physician adherence to diabetes guidelines is suboptimal in Turkey, having negative impact on glycemic control of patients. Better adherence to the SEMT guidelines would provide better glycemic control and, thus, lower the number of chronic complications and slow deterioration of the disease.

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Appendix: ADMIRE Study Group

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