Clinical inertia in glycemic control among a sample of patients with type 2 diabetes in Erbil City, Iraq

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Abstract

Background: Clinical inertia is a failure of starting or intensifying treatment when indicated. Clinical inertia in glycemic control is an important obstacle in intensification with oral anti-diabetic drugs and insulin therapies.

Objectives: To determine the rate of inertia among a sample of physicians treating diabetic patients and to compare the clinical inertia of the physician practicing at different fields of medicine.

Methods: A cross-sectional study was conducted among a sample of 240 adult patients aged ≥ 18 years with type 2 diabetes who attended two Family Medicine Health centers (Brayatti and Shady Health centers), two Teaching Hospitals (Rizgary and Hawler Teaching Hospitals) and one specialized diabetic center (Layla Qasim diabetic center) in Erbil City. Sixty practicing physicians in different specialties participated in this study during the period from the 1st of April 2017 to the end of 28th of November 2017.

Results: The mean of clinical inertia among doctors treating type 2 diabetic patients was 60.8±24.5, the highest rate of inertia was observed among doctors treating poorly controlled diabetics with haemoglobin A1c ≥ 9%. The rate of inertia was significantly correlated to a higher haemoglobin A1c level, serum cholesterol, triglyceride, and blood pressure (p= 0.038, < 0.001, 0.03, and 0.018 respectively), however it was neither correlated to specialties nor to years of experience of the recruited doctors (p = 0.703, 0.29 respectively).

Conclusion: Clinical inertia among physicians providing health care to type 2 diabetic patients in Erbil city is high, and in all the levels of diabetes control according to haemoglobin A1c levels; however the highest rate of inertia is observed among doctors treating patients with haemoglobin A1c ≥9%. Increasing physicians' awareness to follow the updated guidelines to achieve a greater glycemic control is highly recommended.

Key words: clinical inertia, glycated haemoglobin, Erbil

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Introduction

Diabetes affects 387 million people worldwide, about 90% of them are type 2 diabetes mellitus (T2DM) (1). A recent study of eight European countries found only 53.6% of T2DM patients have haemoglobin A1c (Hb A1c <7%) (2). The American Diabetes Association (ADA) and European Association for the Study of Diabetes (EASD) recommends individualized targets based on various factors, including patient preferences, needs and values, co-morbidities, duration of diabetes, risk of hypoglycemia, costs and, ensuring a patient-centered approach, it also recommends stringent glycated hemoglobin (HbA1c) targets of 6–6.5% in newly diagnosed patients, (3) for instance United Kingdom National Institute for health and Clinical Excellence (NICE) recommends targets of 6.5% in newly-diagnosed patients and <7.5% in patients on two or more therapies (4).

One major reason for not achieving these targets is clinical inertia, defined as failure of physicians to initiate or intensify therapy when indicated (5). Clinical inertia is a main barrier in intensification with both oral anti-diabetic drugs (OADs) or insulin therapies (6). A study of the relationship between inertia and the outcome of diabetes care found that, on average, 15% higher frequency of treatment intensification was associated with a 0.15% lower level of HbA1c (7). The are many reasons for clinical inertia which include physician, patient and system-level barriers (8).

Previous studies in developed countries looked at contributing effect of both physician and patient characteristics on clinical inertia. They distributed greater clinical inertia to patient non-compliance, low information about diabetes, improper consultation, inappropriate data registry, border-high limits blood sugar accepted as normal, no clear treatment targets, lack of teamwork, and having no feedback on performance (9-11).

In the USA, a study revealed a delay of initiation of insulin for almost three years in patients with consistently elevated HbA1c levels despite dual OADs therapy (12) a result which was similar to a study in Japan that stated physicians are strongly resistant to initiating insulin in individuals with T2DM, resulting in high levels of HbA1c (9.6%) at the time of recommending insulin to patients (13). Furthermore, another study demonstrated that “differences in physician and patient perceptions of diabetes therapies could deter patients from accepting insulin therapy” (14). Preceding studies from the USA, Canada, and Europe showed widespread clinical inertia among physicians, with the percentage ranging from 30% to 68% (7).

The aim of the present study to find out the clinical inertia among a sample of physicians involved in care of T2DM in Erbil city, to identify the association of clinical inertia with professional characteristics of physicians and patients characteristics, and to determine the relation between doctors clinical inertia and patients adherence to treatment.

Material and methods

This is a cross-sectional study that was carried out in Layla Qasim diabetic center, Rizgary and Hawler Teaching Hospitals, Brayatii and Shadi Family Medicine Health Centers; between the 1st of April 2017 and the 28th of November 2017, starting from the approval of this research protocol by scientific and ethics committees at Kurdistan Board of Medical Specialties. A convenience method of sampling was used for recruiting 60 physicians who currently provide direct patient health care to diabetic patients at different fields of medicine (family physicians, internists, diabetologists, nephrologists, and others), with 240 patients of T2DM, aged ≥ 18 years. All participants were informed of the study objectives, and recruited after providing verbal informed consent.

A specially designed questionnaire was used to address all relevant physician variables like: age, sex, year of graduation, years of experience, field of specialty, place of work, total number of patients, with number of T2DM patients in care seen weekly and number of consultations per day.

Another questionnaire for T2DM patients was used that included patients variables (age, sex, occupation, residence, marital status, educational level, home ownership, duration of the disease, economic status), data on physical activity, diet, smoking, comorbidities, medication, and lastly their drug adherence were considered and scored according to Morisky Medication Adherence Scale (MMAS-4)15. The body mass index (BMI), Blood Pressure (BP), the recorded investigations in the last 3 months including HbA1c, fasting (FBS) and postprandial (PPS) blood sugar, serum cholesterol and triglyceride (TG) of all recruited patients were obtained. Patients with severe disease (less than 6 months life expectancy) were excluded.

At each consultation setting around 10-15 patients were seen; history, examination and the consultation interview between physician and patients were recorded. The 60 enrolled doctors in the above mentioned places who were providing care for T2DM patients were observed for their way of management of the patients with different HbA1c levels; concerning explanation and advice, promoting patients to continue their own medication or escalating the dose, or adding 2nd or 3rd OADs, and or starting Insulin; if HbA1c was ≤7% and the doctor did not encourage the patient to comply with ordinary therapy this is regarded as clinical inertia. In patients with HbA1c 7.1–7.9%, the doctor should escalate the dose or change the treatment or add a 2nd or 3rd OAD, if it is not to be considered as clinical inertia. In cases where HbA1c was 8.1–8.9%, and previous therapy changed, a 2nd or 3rd drug added, or insulin therapy was initiated this is considered as no clinical inertia and lastly if HbA1c was ≥ 9.0%, only by starting insulin would it not be considered as clinical inertia.

HbA1c levels considered as the reference value for clinical inertia were in agreement with, United Kingdom National

Institute for health and Clinical Excellence (NICE) guideline targets of <6.5% in newly-diagnosed patients and <7.5% in patients on two or more therapies for 3–6 months.

The Socio-economic status (SES) scoring for patients that ranged from 0-12 was calculated from educational level (0 illiterate, 1 reads and writes, 2 primary, 3 intermediate, 4 secondary, and 5 college and above level); house ownership (2 owned, 1 partially owned, and 0 for rented and others); family income (2 if income exceeds needs, 1 if it is enough, and 0 if not enough); and 1 score for each of crowding index (less than 2 persons per room), occupation (if employed), and car ownership. Scoring lower than 5 was considered as low SES, 5-8 as medium SES, and more than 8 is considered as high SES.

Statistical analysis:
Data management and statistical analysis were performed by using Statistical Package for Social Sciences (SPSS, version 22); for comparison between proportions Chi square test was used. Fisher's exact test was used for the expected count, if more than 20% of the cells of the table was less than 5. For comparison the mean of 2 study groups of 2 independent samples Student's t test was used, to compare three means we used (ANOVA) test and to compare each 2 means a post-hoc test (LSD) was used. A p value was regarded as statistically significant if ≤ 0.05.

Results

Two hundred and forty patients were recruited in this study, with mean age (±SD) of 57.3±10.3, median age was 58 years, 63.8% of them were female, most of them (94.6%) from urban areas. Concerning the socio-economic state of the enrolled patients: 53.75% of them were of low SES, 33.75% with medium SES and only 12.5% of patients of high SES.

The mean age ± SD of the sixty doctors who participated in the study were 46.87 ± 8.40, ranging from 33 to 69 years. The mean of duration of service was 23.3 years, and that of years of experience was 12.85 years, 54% of them had more than 10 years specialty experience. The mean number of diabetics examined per day (by a doctor) was 4.75 patients; the details are presented in (Tables 1 & 2).

Table 1: Summary of numerical variables of doctors (n = sixty)

Variables	Mean	±SD	Median	Minimum	Maximum
Age of doctor	46.87	8.41	45.00	33.00	69.00
Duration of service	23.33	8.42	22.00	9.00	45.00
Years of experience	12.85	8.12	11.50	2.00	39.00
Patients examined / week	95.00	56.56	80.00	25.00	250.00
T2 DM patients / week	21.72	18.09	15.00	2.00	80.00
T2 DM patients / day	4.75	4.81	3.00	0.00	30.00
Journals read / month	3.82	3.81	3.00	0.00	20.00
CME scores / year	37.10	45.04	17.00	0.00	207.00

Table 2: Age and gender distribution of doctors

	No.	%
Age in years		
< 40	10	16.7
40-49	28	46.7
50-59	17	28.3
≥ 60	5	8.3
Gender		
Male	52	86.7
Female	8	13.3
Total	60	100.0

The majority of doctors were either board certified (58.3%), or PhD holders (10%). More than half (60%) were specialists in internal medicine, and 25% in family medicine. Regarding the type of facility, many of the doctors, work in more than one facility (Table 3).

Table 3: Distribution of doctors by qualification, specialty, and type of health care facility (n = 60)

	No.	%
Qualification (degrees)*		
Board	35	58.3
Diploma	13	21.7
Master	18	30.0
PhD	6	10.0
Others	4	6.7
Specialty*		
Internal medicine	36	60.0
Family practice	15	25.0
Diabetologist	7	11.7
Neurologist	6	10.0
Nephrologist	3	5.0
Cardiologist	5	8.3
Type of facility		
Private clinic	41	68.3
Multi-specialty group	15	25.0
PHCC	3	5.0
Hospital	33	55.0
Medical college practice	7	11.7

*Some doctors have more than one degree or more than one specialty.

The proportion of doctors at all levels of diabetes control that were assessed by HbA1c was approximately more than 50% and they did not comply with the DM management guidelines. The rate of inertia was 71.7% among doctors treating poorly controlled diabetics (HbA1c ≥ 9%), which was significantly (p = 0.038) higher than the rate (53.3%) among doctors treating controlled diabetes (HbA1c ≤ 7%) (Table 4).

Table 4: Clinical inertia practiced by doctors according to HbA1c levels.

	Clinical inertia		No clinical inertia		p
HbA1c %	**No.**	**%**	**No.**	**%**	
≤7	32	53.3	28	46.7	Reference
7.1-7.9	34	56.7	26	43.3	0.0713
8-8.9	37	61.7	23	38.3	0.355
≥9	43	71.7	17	28.3	0.038

Although the lowest rate of inertia was observed among family physicians working at family medicine health centers in comparison with other specialties however the difference was not statistically significant (Table 5).

Table 5: Rate of inertia among physicians by specialty of physicians

	Family Physician (n = 15)		Diabetologists (n = 6)		Others (n = 39)		p
HbA1c %	**No.**	**%**	**No.**	**%**	**No.**	**%**	
≤7	6	40.0	5	83.3	21	53.8	0.253*
7.1-7.9	8	53.3	3	50.0	23	59.0	0.856*
8-8.9	8	53.3	4	66.7	25	64.1	0.718*
≥9	12	80.0	2	33.3	29	74.4	0.114*

*By Fisher's exact test (Comparing the three rates of inertia in each category of HbA1c).

The difference in mean inertia scores among different specialties of doctors whether family medicine doctors, diabetologists or other specialties was statistically not significant (p = 0.703) (Table 6).

Table 6. Mean inertia scores by specialty of physicians

Specialty	N	Mean inertia score	SD	p (ANOVA)
Family Physician	15	56.666	31.623	
Diabetologist	6	58.330	13.693	0.703
Others	39	62.821	22.849	
Total	60	60.833	24.515	

In each field of medicine among the studied doctors there was no significant association between inertia and years of experience (p= 0.29); the inertia mean (±SD) for doctors with less than 10 years' experience and those with expertise of more than 10 years was 58.9 (±23.77), and 62.5 (±26.18) respectively.

The mean inertia score among practicing physicians when dealing with uncontrolled diabetics was significantly higher compared to the score of treating controlled diabetics (62.3, 51.5 respectively) (p = 0.020). On the other hand, the mean of inertia among diabetic care providing physicians was significantly higher among corresponding patients with high BP, uncontrolled cholesterol and uncontrolled TG (p=0.018, p< 0.001, p=0.03 respectively). However there was no significant association between mean inertia scores with presence of comorbidities, healthy diet, and physical activity advice (Table 7).

Table 7. Mean inertia scores by patients' characteristics (t test results).

Variables	Categories	N	Mean inertia score	SD	P
Glycemic control	Uncontrolled	207	62.31	23.99	0.020
	Controlled	33	51.51	27.908	
Hypertension	Yes	137	67.5	25.55	0.018
	No	103	54.16	22.82	
Total cholesterol	> 200 mg/dl	165	64.69	22.76	< 0.001
	≤ 200 mg/dl	75	52.33	27.00	
Triglycerides	> 150 mg/dl	199	66.66	26.53	0.03
	≤ 150 mg/dl	41	55	22.16	
Comorbidities	Yes	183	60.93	24.65	0.915
	No	57	60.53	25.42	
Healthy diet	Yes	169	60.50	24.79	0.751
	No	71	61.62	24.94	
Physical activity advice	Yes	43	60.47	28.47	0.915
	No	197	60.91	23.99	

The difference was not significant in the mean inertia scores in different categories of BMI (p = 0.233), and in different groups of drug adherence (p = 0.147). Regarding the number of anti-diabetic drugs taken by the patient, the mean inertia score (73.75) among doctors dealing with patients who take one OAD was significantly higher than the means (55.72 and 61.94) among doctors dealing with patients taking two or three OADs respectively (p = 0.003 and p = 0.045 respectively) (Table 8).

Table 8. Mean inertia scores by patients' characteristics (ANOVA and LSD test results)

Variables	N	Mean scores inertia	SD	p (ANOVA)	LSD (groups)	p (LSD)
BMI						
A)< 25	34	66.18	24.53	0.233	A X B	0.294
B)25-29	87	60.92	24.02		A X C	0.335
C)30-34	86	61.34	25.34		A X D	0.041
D)≥ 35	33	53.79	25.09		B X C	0.912
Total	240	60.83	24.79		B X D	0.160
					C X D	0.137
Adherence						
A)High adherence	100	61.00	24.95	0.147	A X B	0.708
B)Intermediate adherence	133	59.77	24.97		A X C	0.070
C)Low adherence	7	78.57	9.45		B X C	0.051
Total	240	60.83	24.79			
OAD						
A)None	3	66.67	14.43	.024	A X B	0.640
B)1 drug	20	73.75	18.98		A X C	0.447
C)2 drugs	83	55.72	25.40		A X D	0.741
D)3 drugs	134	61.94	24.66		B X C	0.003
Total	240	60.83	24.79		B X D	0.045
					C X D	0.070

Discussion

Attaining strict glycemic control in the early stage of the disease will decline the substantial burden of diabetes related complications. Despite this evidence, globally; only a small percentage of people with T2DM are achieving good glycemic targets (16).

A few studies on clinical inertia in the management of glycemic control among T2DM have been performed in the USA, Europe(7) and Brazil (17) and this is the first study in Iraq and Erbil city designed to find out the clinical inertia among physicians treating T2DM; the mean of inertia among physicians was 60.8% ± 24.5 in the current study, a result which is comparable to a USA study (New England and Florida) finding of 68% inertia in treating patients with HbA1c > 8% over 16 months(18), and another USA (Boston)(19) study and a Croatian study(7) (58%, and 57.7% respectively).

Unexpectedly the rate of inertia among doctors steadily increased with a higher level of HbA1c; the rate of inertia was much higher when they treated those patients with worse glycemic control; about two thirds of them had inertia in HbA1c levels of ≥9%, which was significantly (p =0.038) higher than the rate (53.3%) among doctors treating more controlled T2DM patients (HbA1c ≤7%).

This difference in the rate of inertia is probably explained by the management intervention of doctors at different HbA1c levels which is nearly the same; where less treatment escalation is needed with better glycemic control (i.e. ≤7), whereas treatment intensification is either by increasing the dose or adding 2nd, 3rd OADs or adding insulin is required.

The doctor's reluctance to initiate insulin to patients with HbA1c ≥9% was the reason for this high mean of inertia. This hesitation in starting insulin therapy may be correlated with insufficient knowledge and professionalism among physicians or inadequate resources.

When there is a high HbA1c it may signify a patient who is more difficult to treat, and may have more comorbidities which could partly clarify clinical inertia. In disparity, we found no relation between the presence of comorbidities and clinical inertia; however in the presence of comorbidities (hypertension, high lipid) controlling of these comorbidities by properly managing them has a significant relation with clinical inertia.

As regards the clinical inertia among patients with HbA1c% (7.1-7.9) and (8-8.9) which necessitates adding 2nd or 3rd OADs, the study revealed around 60% of inertia. This may indicate that such uncontrolled diabetes probably was underestimated by the doctors, and failure to step up the dose of oral diabetes treatment is frequent in diabetes management, with only 22% of patients receiving intensified oral diabetes treatment in hyperglycemic visits (20).

Although the rate of inertia, in the current study among participant physicians was not correlated significantly to their different specialties in spite of having some difference, the lowest rate of inertia was observed among family physicians. One reason could be that majority of family physicians provide more attention and spend more time with their patients.

On the other hand concerning the correlation between rate of inertia and doctor specialties at different HbA1c levels; the highest inertia in HbA1c ≤7% was among diabetologists (83%) compared with only 40% recorded by family doctors. This indicates that they had a significant role in encouraging patients to take the prescribed medication regularly, compared with diabetologists who may pay less attention regarding providing instruction and advice and initiating OADs in this level of HbA1c. Moreover the current study revealed the lowest rate of inertia in HbA1c ≥9% level among diabetologists in comparison with other specialties which means they are more aware about initiating insulin therapy according to the guidelines. Unusually a similar study showed that patients who were treated by diabetologists experience more clinical inertia than those treated by family physicians (7).

Clinical inertia required concurrence of patients with physicians and health system. There are a lot of factors touched by clinical inertia and these are related to patient, physicians and health care resources.

In the current study among 240 enrolled patients with T2DM only 13.7% of them had good glycemic control (HbA1c ≤7). This alarming data could be due to any of three relevant factors; patients themselves (denial of disease, lack of symptoms, medication side effects, too many medication,s cost of medication, poor health literacy, or poor communication with clinician) or the health system (no clinical guidelines, no disease registry, no visit planning, poor communication between clinician and office staff), or related to doctors clinical inertia. We found that the mean rate of inertia among doctors treating such well controlled (HbA1c ≤7) patients was significantly (p= 0.02) lower than that of doctors treating uncontrolled patients and this could be related to more adherence to the guidelines, they have more sufficient focus or emphasis on goal attainment and provide proactive care rather than reactive care for their patients.

The rate of inertia was significantly correlated to a higher HbA1c level, serum cholesterol, triglyceride, and blood pressure (p= 0.038, < 0.001, 0.03, and 0.018 respectively); the above mentioned three variables (HbA1c, serum cholesterol and blood pressure) are truly reflecting the glycemic control of T2DM patient (21), which is why it is clearly correlated with rate of inertia.

The study claimed a significant correlation between the rate of inertia and number of OADs that were in use by enrolled patients; obviously there was more inertia among doctors when they treated those patients taking one type of OAD than those taking 2nd or 3rd OADs (p = 0.003 and p = 0.045 respectively) which means there was reluctance to add further OADs. This may be clarified by more dealing with symptomatic problems of the patient while less pressing issues like intensifying medication therapy may be postponed to future encounters.

Conclusion

This study found that clinical inertia among physicians dealing with T2DM patient was high, and there was inertia in all the levels of diabetes control as assessed by HbA1c. However the highest rate of inertia was among doctors treating badly controlled diabetics (HbA1c ≥9%). Such observations further stress the need for better surveillance, organization and supervision of diabetic care by a better disease registry, arranging a regular planning visit of the patients, and increasing awareness of physicians regarding the guidelines.

References

1. International Diabetes Federation. International Diabetes Federation Diabetes Atlas Update 2012. IDF, Brussels, Belgium. Available from: http://www.idf.org/diabetesatlas (accessed April 2015)
2. Stone MA, Charpentier G, Doggen K, Kuss O, Lindblad U, Kellner C, et al. Quality of care of people with type 2 diabetes in eight European countries: findings from the Guideline Adherence to Enhance Care (GUIDANCE) study. Diabetes Care2013; 36(9):2628-38.
3. Inzucchi SE, Berganstal RM, Buse JB, Diamant M, Ferrannini E, Nauck M, et al. Management of hyperglycemia in type 2 diabetes: A patient-centered approach. Update to a position statement of the American Diabetes Association and the European Association for the Study of Diabetes. Diabetes Care 2015; 38:140-9.
4. Chatterton H, Younger T, Fischer A, Khunti K. Risk identification and interventions to prevent type 2 diabetes in adults at high risk: Summary of NICE guidance. BMJ 2012, 345(7867).
5. Phillips LS, Branch WT, Cook CB, Doyle JP, El-Kebbi IM, Gallina MD, et al. Clinical Inertia. Ann Intern Med 2001; 135(9):825-34.
6. Guisasola FA, Mavros P, Nocea G, Alemao E, Alexander CM, Yin D. Glycaemic control among patients with type 2 diabetes mellitus in seven European countries: findings from the Real-Life Effectiveness and Care Patterns of Diabetes Management (RECAP-DM) study. Diabetes Obes Metab 2008; 10(1):8-15.
7. Bralić Lang V, Bergman Marković B, Kranjčević K. Family physician clinical inertia in glycemic control among patients with Type 2 Diabetes. Med SciMonit, 2015; 21: 403-411

8. Zafar A, Stone MA, Davies MJ, Khunti K. Acknowledging and allocating responsibility for clinical inertia in the management of Type 2 diabetes in primary care: a qualitative study. Diabet Med 2015;32:407-13.
9. Carratalá MC, Gil-Guillen VF, Orozco D: Barriers as¬sociated with poor control in Spanish diabetic patients. Int J ClinPract, 2013; 67(9): 888–94
10. Schwartz FL, Marling CR, Shubrook J: Automated glycemic pattern analy¬sis: overcoming diabetes clinical inertia. J Diabetes SciTechnol, 2013; 7(1): 167–69
11. Ziemer DC, Doyle JP, Barnes CS,Cook CB, El-Kebbi IM, Gallina DL, et al. An intervention to overcome clini¬cal inertia and improve diabetes mellitus control in a primary care setting: Improving Primary Care of African Americans with Diabetes (IPCAAD) 8. Arch Intern Med, 2006; 166(5): 507–13
12. Home P, Naggar NE, Khamseh M, Gonzalez-GalvezG, Shen C, Chakkarwar P, et al. An observational non-interventional study of people with diabetes beginning or changed to insulin analogue therapy in non-Western countries: the A1chieve study. Diabetes Res ClinPract 2011;94:352–63.
13. Ishii H, Iwamoto Y, Tajima N. An exploration of barriers to insulin initiation for physicians in Japan: findings from the Diabetes Attitudes, Wishes and Needs (DAWN) Japan study. PLoS ONE 2012;7(6):1-8
14. Yoshioka N, Ishii H, Tajima N, Iwamoto Y, The DAWN Japan group. Differences in physician and patient perceptions about insulin therapy for management of type 2 diabetes: the DAWN Japan study. Curr Med Res Opin 2013;1–7.
15. Morisky DE, Green LW, Levine DM. Concurrent and predictive validity of a self-reported measure of medication adherence. Med Care1986;24(1):67-74.
16. Holman RR, Paul SK, Bethel MA, Matthews DR, Neil HA. 10-year follow-up of intensive glucose control in type 2 diabetes. N Engl J Med 2008; 359:1577-89.
17. Vencio S, Paldanius P, Bluher M, Gainella-Neto D, Caiado-Vencio R, Strain D. Understanding the barriers and improving care in type 2 diabetes: Brazilian perspective in time to do more in diabetes. DiabetolMetabSyndr2017; 9:46
18. Berlowitz DR, Ash AS, Glickman M, Friedman RH, Pogach LM, Nelson AL et al. Developing a Quality of Measure for Clinical Inertia in Diabetes Care. Health ServRes. 2005;40: 1836-53
19. Grant RW, Cagliero E, Dubey A, Gildesgame, Chueh H, Barry M et al. Clinical inertia in the management of type 2 diabetes metabolic risk factors. Diabet Med2004; 21 (2): 150–5.
20. Bolen SD, Bricker E, Samuels TA, Yeh H, Marinopoulus S, McGuire M et al: Factors Associated With Intensification of Oral Diabetes Medications in Primary Care Provider-Patient Dyads: A Cohort Study. Diabetes Care, 2009; 32: 25–31
21. U.K. Prospective Diabetes Study (UKPDS) Group. 1998. ‘‘Intensive Blood-Glucose Control with Sulphonylureas or Insulin Compared with Conventional Treatment and Risk of Complications in Patients with Type 2 Diabetes (UKPDS 33).’’Lancet 352 (9131): 837–53