

## Original Research Article

# Guideline for Adherence and Diabetes Control in Co-Morbid Conditions in a Tertiary Hospital in Malaysia

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### Abstract

**Purpose:** To evaluate doctors' adherence to Malaysian Clinical Practice Guideline (CPG) 2009 in established diabetic patients with hypertension, dyslipidemia, renal diseases, obesity, and also to assess factors associated with guideline adherence and diabetes mellitus control in Pulau Pinang Hospital, Malaysia.

**Method:** Prescriptions written by 24 doctors for 480 established diabetic patients with hypertension, dyslipidemia, renal diseases and obesity (20 patients per doctor) were noted. The control of the disease and CPG adherence were noted from the selected prescriptions.

**Results:** Three hundred and forty nine (72.7 %) patients received guideline-compliant pharmacotherapy. CPG adherence had statistically non-significant association ( $p < 0.301$ ) with hypertension, hypertension with dyslipidemia ( $p < 0.078$ ), dyslipidemia ( $p < 0.061$ ), renal diseases ( $p < 0.544$ ) and obesity ( $p < 0.073$ ). Two hundred and ninety nine (62.3 %) patients were at goal blood glucose level. Diabetes Mellitus (DM) control had statistically significant association ( $\Phi = 0.583$ ,  $p < 0.001$ ) with guideline compliance and statistically non-significant association ( $p < 0.066$ ) with comorbidities and also non-significant association ( $p < 0.300$ ) with therapies.

**Conclusion:** Prescribing practices were fairly compliant with guidelines. Doctors poorly adhered to guidelines in diabetic patients with hypertension, dyslipidemia, renal diseases and obesity. Significantly better diabetic control was seen in patients who were on monotherapy and guidelines-adherent therapy.

**Keywords:** Guidelines, Adherence, Diabetes control, Diabetes mellitus (DM), Co-morbidities

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## INTRODUCTION

Diabetes mellitus is a chronic, progressive disease, which has reached a dangerous stage all over the world. If not managed appropriately, acute and long-term complications may compromise the patient's discomfort and possibly result in loss of life. WHO estimates that more than 346 million people worldwide have diabetes, and the number is likely to more than double by 2030 without intervention [1]. The occurrence of

type 2 diabetes is quickly increasing, particularly in older [2], overweight subjects who have associated cardiovascular risks [2].

Diabetes prevalence continues its unparalleled rise globally [3]. Although evidence suggests that the use of systematically developed evidence-based clinical practice guidelines has the potential to improve the quality of patient care as well as the satisfaction of patients and doctor compliance with these guidelines [4]. Clinical

guidelines are recommended by healthcare professionals to increase the effectiveness both of patient diagnosis and treatment [5].

The need to improve the control of diabetes mellitus has initiated the requirement of different diabetes mellitus management guidelines [6]. Malaysian Diabetes Society has also developed the latest guideline for the management of diabetes mellitus in 2009, i.e., CPG (2009). Tight control of diabetes mellitus is necessary for reducing the risks of CVD and other complications [7]. Observational studies have concluded that the health care providers' attitudes, behavior toward diabetes mellitus management and variation from the clinical practice guidelines resulted in more than 60 % of the poor control of diabetes mellitus [8].

Several co-morbidities are present with diabetes mellitus. These co-morbidities incorporate both single and multiple co-morbidities [9]. The important co-morbidities include hypertension, dyslipidemia, renal diseases and obesity. No study has been conducted in Malaysia to evaluate doctors' compliance with clinical practice guideline on management of co-morbid conditions in diabetes mellitus.

Accessible literature shows that patients with diabetes mellitus are not being treated according to guidelines [10]. The present study was conducted to evaluate doctors' adherence to medication recommendations of Malaysian clinical practice guidelines for management of diabetes mellitus (Clinical Practice Guideline 2009). In addition, this study also aimed to evaluate factors associated with guidelines adherence and control of diabetes mellitus in established diabetic patients with co-morbidities.

## EXPERIMENTAL

This was a cross-study performed at wards of medicine, hypertension, cardiology and nephrology of Pulau Pinang Hospital, Malaysia. During the study period, the doctors (n = 24) practicing at cited wards were enrolled to the present study and a signed written consent form obtained. In order to evaluate prescriptions written by each enrolled doctor to a purposive sample of 20 prescriptions written by these doctors for different patients were obtained from the hospital records.

A total of 480 established diabetic patients with co-morbidities who had clinical encounters with the enrolled doctors were included in the study.

The inclusion criteria were: established diabetic patients with co-morbidities, aged  $\geq 18$  years and  $< 80$  years, clinical encounters with enrolled doctors at Pulau Pinang Hospital. All pregnant diabetic patients and patients who were referred for follow-up to clinics or doctors other than selected doctors and wards of Pulau Pinang Hospital were excluded.

A validated data collection tool was used to obtain patients' demographic and clinical data. Diabetes mellitus diagnosis and prescribed medications for co-morbidities were collected from patients' medical record. Single or multiple comorbidities and treatment with monotherapy or combination therapy were noted as prescription status. Detailed review of the patients' medical record was carried out to note adverse drug reactions, contraindications and declaration about the inefficacy of a drug which may indicate why the drug was changed or not prescribed or other acceptable justifications for non-adherence to guidelines.

The glycemic goals were evaluated on the basis of defined criteria of CPG 2009. The patients were classified as having controlled or uncontrolled diabetes mellitus. Furthermore, the patients were categorized as adherent or non-adherent to prescribed medications.

Doctors' were categorized as adherent to guidelines if they satisfied one of the following criteria:

- i. CPG 2009 recommended drugs of choice for the specific condition was prescribed to the patient.
- ii. CPG 2009 recommended first line medication having no contraindications to its use were prescribed to patients with single or multiple co-morbidities.
- iii. CPG 2009 recommended first line agent for a specific condition was not prescribed due to adverse drug reactions caused by the recommended drug, contraindication to its use or the drug was altered due to inefficacy.

## Data analysis

Data were analyzed by using Statistical Package for Social Sciences (version 20). Categorical data were reported as frequencies and percentages, and continuous data as mean  $\pm$  SD. Chi-square and Fischers Exact tests were

used to detect significance between categorical variables.  $p < 0.05$  was considered statistically significant. When significant association was observed, the strength and direction of association was determined using Phi coefficient. Phi values from 0.000 to  $< 0.10$ ,  $0.10$  to  $< 0.2$ , and  $0.20$  to  $< 0.40$  were considered as negligible, weak and moderate association, respectively [11].

### Ethical approval

This study was approved by the Ministry of Health Medical Research Ethics Committee (MREC) Malaysia.

## RESULTS

### Demographical and clinical characteristics of patients

Of the 480 established diabetic patients with single and multiple co-morbidities included, 246 (51.3 %) were males and 234 (48.8 %) were females. Mean age of the patients was  $57.14 \pm 10.0$  years, 152 (31.7 %) had age  $< 61$  years. The study sample was ethnically diverse and consisted of Malay 211 (44.0 %), Chinese 165 (34.4 %), Indian 91 (19.0 %), and other ethnicities 13 (2.6 %).

Majority of the patients 213 (44.4 %) have had diabetes for 5 to 10 years, 90 (18.8 %) for 2 to 5 years, while 177 (36.9 %) have had it for more than ten years. Of the 480 patients, 358 (74.6 %) had a single co-morbidity while 122 (25.4 %) had two co-morbidities. The most common comorbidity was hypertension 202 (42.1 %), followed by hypertension with dyslipidemia 122 (25.4 %), dyslipidemia 119 (24.8 %), renal disease 32 (6.7 %) and obesity 5 (1.0 %). Gender and age distribution of co-morbidities are as shown in Table 1.

### Clinical practice guidelines adherence

Three hundred and forty nine patients (72.7 %) received CPG (2009) guideline compliant therapy. However, there was no statistically significant association between prescription medication according to CPG and patient's co-morbidity.  $p > 0.05$  (Table 2).

### Diabetes mellitus control

Table 3 shows the factors associated with diabetes mellitus control. 299 (62.3 %) patients had good control of their diabetes. Diabetes mellitus control was found to have a statistically significant moderate positive association with CPG compliance ( $\Phi = 0.585$ ,  $p < 0.001$ ). The relationship between number of co-morbidities, type of therapy and diabetes control is shown in Table 3.

## DISCUSSION

An overall fair level of adherence to medication recommendations of CPG (2009) was observed. More than two third of the total prescriptions taken were in compliance with CPG 2009. This finding is in contrast to some of the previous studies [12,13] which have reported poor adherence to guidelines, but is in compliance with one study which reported good adherence of physicians with guidelines [14]. The poor adherence of other studies may be due to the co-morbidity of the diseases.

According to Coon & Zulkowski, doctors usually had good adherence to guidelines in diabetes mellitus management but patients with co-morbid conditions of hypertension and dyslipidemia were not optimally managed according to the ADA guidelines [15].

A similar report about poor compliance of doctors' to hypertension guidelines while managing hypertension in diabetic patients was

Table 1: Gender and age distribution of comorbidities

Variables	Gender, N (%)		Age, N (%)		Total, N (%)
	Males	Females	>61 years	<61 years	
Single co-morbidity	184 (51.4)	174 (48.6)	103(28.8)	255 (71.2)	358 (74.6)
Double co-morbidities	62 (50.8)	60 (49.2)	49 (40.2)	73 (59.8)	122 (25.4)
Hypertension	97 (39.4)	105 (44.9)	65 (42.8)	137 (41.7)	202 (42.1)
Hypertension and dyslipidemia	62 (25.3)	60 (25.6)	49 (32.2)	73 (22.3)	122 (25.4)
Dyslipidemia	64 (26.0)	55 (23.5)	25 (16.4)	94 (28.7)	119 (24.8)
Renal Disease	18 (7.3)	14 (6.0)	10 (6.6)	22 (6.7)	32 (6.7)
Obesity	5 (2.0)	0 (0.0)	3 (2.0)	2 (0.6)	5 (1.0)

**Table 2:** Factors associated with clinical practice guidelines adherence

Variable	CPG adherence, N (%)		P-value
	Yes	No	
Prescription status	349 (72.7)	131 (27.3)	0.301 <sup>b</sup>
Hypertension			
Yes	152 (75.2)	50 (24.8)	
No	197 (70.9)	81 (29.1)	
Hypertension and dyslipidemia			0.078 <sup>b</sup>
Yes	81 (66.4)	41 (33.6)	
No	268 (74.9)	90 (25.1)	
Dyslipidemia			0.061 <sup>a</sup>
Yes	87 (73.1)	32 (26.9)	
No	2062(72.6)	99 (27.4)	
Renal Disease			0.544 <sup>b</sup>
Yes	25 (78.1)	7 (21.9)	
No	324 (72.3)	124 (27.7)	
Obesity			0.073 <sup>a</sup>
Yes	4 (80.0)	1 (20.0)	
No	345 (72.6)	130 (27.3)	

<sup>a</sup> Chi square test; <sup>b</sup> Fischer exact test; CPG = Malaysian clinical practice guidelines

**Table 3:** Factors associated with diabetes mellitus control

Variable	Diabetes mellitus control, N (%)		P-value	Effective size ( $\Phi$ )
	Yes	No		
Patient Status	299 (62.3)	181 (37.7)		
<b>CPG compliance</b>			0.001 <sup>a</sup>	0.585
Yes	278 (79.7)	71 (20.3)		
No	21 (16.0)	110 (84.0)		
<b>Co-morbidity</b>			0.066 <sup>b</sup>	-
Single co-morbidity	232 (64.8)	126 (35.2)		
Double co-morbidity	67 (54.9)	55 (45.1)		
<b>Therapy type</b>			0.300 <sup>b</sup>	-
Mono therapy	148 (64.9)	80 (35.1)		
Combination therapy	151 (59.9)	101 (40.1)		

<sup>a</sup> Chi square test; <sup>b</sup> Fischer exact test; CPG = Malaysian clinical practice guidelines;  $\Phi$  = Phi value

shown by another study conducted in Malaysia, where only 18.3 % of the diabetic hypertensive patients were on guidelines recommended ACE inhibitors [16].

In the present study, the possible reason for poor control and poor adherence to guidelines while treating diabetes mellitus in hypertension, dyslipidemia, hypertension with dyslipidemia, renal diseases and obesity might be the fact that the doctors focused on treating the co-morbid disease. However, a large-scale study in various clinics will be needed to confirm this. In the current study, majority of the patients were at goal diabetes mellitus control, the rate was more than that of other studies conducted in Malaysia[17,18].

Reasons for this good hypertension control in the participants in this study compared to other studies conducted in Malaysia may be due to the

proper pharmacotherapy and doctors' greater compliance to diabetes mellitus guidelines. Similar better diabetes control in patients suffering from hypertension is reported by a previous studies conducted [18,19]. In the present study, better control of diabetes mellitus in patients suffering from co-morbid conditions might be due to physicians seeing the patients with a critical disease pay more attention. Thus physicians and patients become more alert to the needs of maintain blood glucose levels, once organ and vascular complications present.

Diabetes mellitus control had statistically significant moderate positive association with CPG adherence and diabetes mellitus control. Majority of the previous studies which have evaluated physicians' adherence to diabetes mellitus guidelines have not related practices to DM control. This finding was in compliance with the other previous studies conducted where

adherence to recommended practice resulted in good control of disease [20].

In the present study the good control was seen in case of monotherapy as compared with the combination therapy. Similarly, the good control of diabetes mellitus was seen in case of single co-morbidity as compared with multiple co-morbidities.

### Limitations of the study

The major limitation includes is that the study was conducted in a single site. Also, the study evaluated prescribing practices only, and not the other mechanisms of diabetes mellitus management such as screening, diagnosis and life style involvements. Furthermore, we took prescriptions from the records of the hospital whereas co-morbid conditions of diabetes mellitus need a long observation period to decide whether the diabetes mellitus along with co-morbidities is controlled or not. The non-availability of various anthropometric parameters such as body weight, Body Mass Index (BMI), etc, and statements about patients' compliance with pharmacotherapy are potential limitations associated with this study.

### CONCLUSION

Overall prescribing practices of doctors are in fair compliance with guidelines, but there is room for further improvement in compliance with CPG 2009 which would result in better hypertension control in patients suffering from diabetic co-morbidities. Poor adherence to guidelines in patients suffering from hypertension and dyslipidemia are the areas which need more attention in future. Various strategies for medical education of doctors, seminars, reminder tools and the availability of clinical pharmacist to participate in mutual practices, as well as motivating patients to take part in diabetes mellitus goal achievement, may enhance guidelines adherence and diabetes mellitus control.

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### REFERENCES

1. Seidu S, & Khunti K. Non-adherence to diabetes guidelines in primary care—The enemy of evidence-

- based practice. *Diabetes research and clinical practice* 2012; 95(3), 301-302.
2. Al-Qazaz HK, Hassali MA, Shafie AA, Syed Sulaiman SA & Sundram. Perception and knowledge of patients with type 2 diabetes in malaysia about their disease and medication: A qualitative study. *Research in Social and Administrative Pharmacy* 2011; 7, 180-191.
3. Ardena, Gregory Joseph Ryan A, Elizabeth Paz-Pacheco, Cecilia A Jimeno, Frances Lina Lantion-Ang, Elizabeth Paterno, and Noel Juban. "Knowledge, attitudes and practices of persons with type 2 diabetes in a rural community: phase I of the community-based Diabetes Self-Management Education (DSME) Program in San Juan, Batangas, Philippines." *Diabetes research and clinical practice* 2010; 90, no. 2, 160-166.
4. Cheng L, Nieman LZ & Becton JL. Changes in perceived effect of practice guidelines among primary care doctors. *Journal of Evaluation in Clinical Practice* 2007; 13, 621-626.
5. Lai C-L & Hou Y-H. The association of clinical guideline adherence and pay-for-performance among patients with diabetes. *Journal of the Chinese Medical Association* 2012; 76, 102-107.
6. Stolar M. Glycemic control and complications in type 2 diabetes mellitus. *The American Journal of Medicine* 2010; 123, S3-S11.
7. Bi Y, Zhu D, Cheng J, Zhu Y, Xu N, Cui S, & Weng J. The status of glycemic control: A cross-sectional study of outpatients with type 2 diabetes mellitus across primary, secondary, and tertiary hospitals in the Jiangsu province of China. *Clinical therapeutics* 2010; 32(5), 973-983.
8. Ratsep A, Oja I, Kalda R & Lember M. Family doctors' assessment of patient-and health care system-related factors contributing to non-adherence to diabetes mellitus guidelines. *Primary Care Diabetes* 2007; 1, 93-97.
9. Struijs JN, Baan CA, Schellevis FG, Westert GP, & van den Bos GA. Comorbidity in patients with diabetes mellitus: impact on medical health care utilization. *BMC health services research* 2006; 6(1), 84.
10. Bovier P, Sebo P, Abetel G, George F & Stalder H. Adherence to recommended standards of diabetes care by swiss primary care physicians. *Swiss Medical Weekly* 2007; 137, 173-81.
11. Kotrlík JWKJW and Williams HAWHA. The Incorporation of Effect Size in Information Technology, Learning, Information Technology, Learning, and Performance Research and Performance Research. *Information Technology, Learning, and Performance Journal*, 2003. 21(1): 1.
12. Kirkman MS, Williams SR, Caffrey HH & Marrero DG. Impact of a program to improve adherence to diabetes guidelines by primary care physicians. *Diabetes Care* 2002; 25, 1946-1951.

13. Vaccaro O, M Boemi, F Cavalot, P De Feo, R Miccoli, L Patti, AA Rivellese, M Trovati, D Ardigo, and I Zavaroni. *The clinical reality of guidelines for primary prevention of cardiovascular disease in type 2 diabetes in Italy. Atherosclerosis* 2008; 198, no. 2 396-402.
14. Satman I, Imamoglu S, & Yilmaz C. *A patient-based study on the adherence of physicians to guidelines for the management of type 2 diabetes in Turkey. Diabetes research and clinical practice* 2012; 98 (1), 75-82.
15. Coon P & Zulkowski K. *Adherence to american diabetes association standards of care by rural health care providers. Diabetes Care* 2002; 25, 2224-2229.
16. Chan G. *Type 2 diabetes mellitus with hypertension at primary healthcare level in Malaysia: Are they managed according to guidelines? Singapore medical journal* 2005; 46-127.
17. Mafauzy M, Hussein Z & Chan S. *The status of diabetes control in malaysia: Results of diabcare 2008. Med J Malaysia* 2011; 66, 175-181.
18. Chew Boon How, I Mastura, PY Lee, T Sri Wahyu, Ai Theng Cheong and A Zaiton. *"Ethnic differences in glycaemic control and complications: the adult diabetes control and management (ADCM), Malaysia." Medical Journal of Malaysia* 2011; 66, no. 3, 244-248.
19. Ahmad N, Hassan Y, Tangiisuran B, Meng OL, Aziz NA, & Khan AH. *Guidelines Adherence and Hypertension Control in an Outpatient Cardiology Clinic in Malaysia. Tropical Journal of Pharmaceutical Research* 2012; 11(4), 665-672.
20. Hetlevik I, Holmen J, Kristensen PL, Iversen H & Furuseth K. *Implementing clinical guidelines in the treatment of diabetes mellitus in general practice. International Journal of Technology Assessment in Health Care* 2000; 16, 210-227.