

Research Article

Guidelines Adherence and Hypertension Control in an Outpatient Cardiology Clinic in Malaysia

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Abstract

Purpose: To evaluate doctors' adherence to Malaysian Clinical Practice Guideline (CPG) 2008 in established hypertensive patients with cardiovascular diseases and factors associated with guideline adherence and hypertension control in Pulau Pinang Hospital, Malaysia.

Methods: Prescriptions written by 13 doctors for 320 established hypertensive patients with cardiovascular diseases (25 patients per doctor) were noted on first visit. Two hundred and sixty (81%) of the enrolled 320 patients (20 patients per doctor) were followed up until the second visit. Blood pressure (BP) noted on the second visit was related to the prescription written on the first visit.

Results: One hundred and ninety one (73.5%) patients received guidelines-compliant pharmacotherapy. CPG adherence had statistically significant association with left ventricular hypertrophy (LVH) ($\Phi = -0.241$, $p < 0.01$) and diabetes ($\Phi = -0.228$, $p < 0.01$). One hundred and fifty four (59.2 %) patients were on goal BP. Hypertension control had statistically significant association with guidelines compliance ($\Phi = 0.175$, $p < 0.01$), angiotensin converting enzyme (ACE) inhibitors ($\Phi = 0.195$, $p < 0.01$), diabetes ($\Phi = -0.148$, $p = 0.017$), LVH ($\Phi = -0.153$, $p = 0.017$) and monotherapy ($\Phi = -0.168$, $p < 0.01$).

Conclusion: Prescribing practices were fairly compliant with guidelines. Doctors poorly adhered to guidelines in hypertensive patients with diabetes and LVH. Significantly better hypertension control was seen in patients who were on ACE inhibitors and guidelines-adherent therapy.

Keywords: Guidelines, Adherence, Hypertension control, Diabetes, Cardiology

Received: 14 July 2011

Revised accepted: 27 May 2012

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INTRODUCTION

The goal of hypertension therapy and control is to reduce morbidity and mortality by preventing cardiovascular, cerebrovascular and renovascular diseases. Randomized control trials have shown that pharmacological intervention and adequate blood pressure control were associated with 20 to 22 % risk reduction of coronary heart disease [1] and 28 to 38 % risk reduction in the incidence of stroke [2]. To improve hypertension control, various hypertension management guidelines have been published, disseminated and regularly updated. These guidelines provide concise, evidence based recommendations to the prescribers in order to achieve optimal hypertension control [3].

Despite the positive impact of guidelines' implementation on hypertension control [4], existing literature suggests that patients with hypertension are not being treated according to guidelines [5]. Observational studies have shown that the health care providers' attitudes, behavior towards hypertension management and deviation from the clinical practice guidelines account for more than 66 % of the poor control of hypertension [6]. Just like other parts of the world, prevalence and poor control of hypertension is alarmingly high in Malaysia. In 2004, 40.5 % of Malaysians aged ≥ 30 years were suffering from hypertension, and only 28.6 % of the treated hypertensive patients were on goal BP [7]. It was also reported that 138,111 of the Malaysian individuals suffered from cardiovascular diseases in 2006, resulted in the death of 9977 people [8]. No study has been conducted in Malaysia to evaluate doctors' compliance with Malaysian clinical practice guidelines on management of hypertension (CPG 2008) [3] in patients with cardiovascular diseases.

This study was conducted to evaluate doctors' adherence to medication recommendations of Malaysian clinical practice guidelines on management of hypertension (CPG 2008). In addition, this

study also aimed to evaluate factors associated with guidelines adherence and hypertension control in established hypertensive patients with cardiovascular diseases.

EXPERIMENTAL

This was a cross-study conducted at the cardiology outpatient clinic of Pulau Pinang Hospital, Malaysia. During the study period, all doctors (n=13) practicing at cardiology outpatient clinic were enrolled in the study and a signed written consent form obtained from them. In order to evaluate prescription written by each enrolled doctor to a purposive sample of 20 patients, a total of 325 established hypertensive patients with cardiovascular comorbidities who had clinical encounter with the enrolled doctors (25 patients per enrolled doctor including drop out rate of 25 %) were included in the study. The inclusion criteria were: established hypertensive patients with cardiovascular disease, aged ≥ 18 years and < 80 years, clinical encounter with enrolled doctor and follow up on next visit at Pulau Pinang Hospital. All pregnant hypertensive patients and patients who were referred for follow up to clinics other than outpatient cardiology clinic of Pulau Pinang Hospital were excluded.

On 1st visit, a purpose-developed validated data collection form was used to collect patients' demographic and clinical data. Hypertension diagnosis and other comorbidities were based on documentation from patients' medical record. Patients with history of angina pectoris, myocardial infarction or any diagnosis of coronary artery disease were considered to have coronary heart disease (CHD). Multiple comorbidities were noted and reported as different disease entities, for example, the number of patients with diabetes mellitus, kidney disease, stroke and others was reported individually. Implicit review of the patients' medical record was conducted to note adverse drug reactions, contraindications and statement about the

inefficacy of a drug which may indicate why the drug is changed or not prescribed or other acceptable rationale for non-adherence to guidelines.

A total of 260 patients of the enrolled 325 patients (20 per enrolled doctor) were followed-up to the 2nd visit. On the second visit, BP readings were noted and patients were categorized either as having controlled or uncontrolled hypertension based on the goals defined by CPG 2008 (Table 1). Prescriptions written on the 1st visit classified either as adherent or non-adherent to CPG 2008 were then related to hypertension control status on the 2nd visit.

Table 1: Malaysian Clinical Practice Guidelines (CPG 2008) recommended BP goals [3]

Patient assessment	BP goal (mm Hg)
Hypertension with cardiovascular and/or cerebrovascular diseases	< 140/85
Hypertension with Diabetes and/or CKD	< 130/80
Hypertension with proteinuria ≥ 1 g/24 h	< 125/75

CKD = chronic kidney disease

Doctors' were considered compliant to guidelines if they satisfied one of the following criteria:

- i. CPG 2008 recommended first line agents for the particular condition was prescribed to the patient.
- ii. CPG 2008 recommended first line agents having no contraindications to its use were prescribed to patients with multiple comorbidities.
- iii. CPG 2008 recommended first line agent for a particular condition was not prescribed because of adverse drug reactions caused by the recommended drug, contraindication to its use or the drug was changed because of inefficacy.

Data analysis

Data were analyzed by using Statistical Package for Social Sciences (version 16.0, SPSS Inc, Chicago, IL). Categorical data were reported as frequencies and percentages, and continuous data as mean \pm SD. Chi-square and Fishers 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 [9]. A negative *Phi* value indicates negative association between the variables [10].

Ethical approval

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

RESULTS

Patients' demographic and clinical characteristics

Of the 260 established hypertensive patients with cardiovascular comorbidities included in the final analysis, 166 (63.8%) were males. Mean age of the patients was 62.3 ± 10.0 years, 156 (60%) had age ≤ 65 years. The study sample was ethnically diverse and consisted of Chinese 111 (42.7 %), Malay 91 (35 %), Indian 53 (20.4 %), and other ethnicities, 5 (1.9 %). Two hundred and nine (80.4 %) were non-smokers and 251 (96.5 %) were teetotalers. Only 23 (8.8 %) patients had a positive family history of cardiovascular disease.

The number of comorbidities recorded were 674. Only 31 (11.9 %) had a single comorbidity, while 97 (37.3 %), 87 (33.5 %), 45 (17.3 %) had two, three and more than three comorbidities, respectively. The most

Table 2: Gender and age-wise distribution of comorbidities

Variable	Gender, N (%)		Age, N (%)		Total N (%)
	Male	Female	> 65 years	< 65 years	
No. of Comorbidities					
1	13 (41.93)	18 (58.06)	11 (35.48)	20 (64.51)	31 (11.9)
2	63 (64.94)	34 (35.05)	39 (40.02)	58 (59.79)	97 (37.3)
3	62 (71.26)	25 (28.73)	37 (42.52)	50 (57.47)	87 (33.5)
>3	28 (62.22)	17 (37.77)	17 (37.77)	28 (62.22)	45 (17.3)
CHD	152 (91.6)	70 (74.5)	82 (78.8)	140 (89.7)	222 (32.9)
HF	48 (28.9)	36 (38.3)	38 (36.5)	46 (29.5)	84 (12.46)
LVH	7 (4.2)	5 (5.3)	5 (4.8)	7 (4.5)	12 (1.78)
Dyslipidemia	98 (59.0)	45 (47.9)	52 (50.0)	91 (58.3)	143 (21.21)
DM	82 (49.4)	42 (44.7)	51 (49.0)	73 (46.8)	124 (18.39)
CKD	20 (12.0)	10 (10.6)	13 (12.5)	17 (10.9)	30 (4.45)
Cerebrovascular disease	13 (7.8)	13 (13.8)	20 (19.2)	6 (3.8)	26 (3.85)
Asthma	10 (47.61)	11 (52.38)	6 (28.57)	15 (71.42)	21 (3.11)
Gout	6 (75)	2 (25)	3 (37.5)	5 (62.5)	8 (1.18)
PVD	1 (25)	3 (75)	-	4 (100)	4 (0.59)

CHD = coronary heart disease; CKD = chronic kidney disease; CVD = cardiovascular disease; DM = diabetes mellitus; LVH = left ventricular hypertrophy; PVD = peripheral vascular disease

common comorbidity was coronary heart disease with 222 (32.9 %) having this condition, followed by dyslipidemia 143 (21.2 %), diabetes mellitus 124 (18.4 %), heart failure 84 (12.5 %), chronic kidney disease 30 (4.5 %), cerebrovascular disease 26 (3.9 %), asthma 21 (3.1 %), left ventricular hypertrophy 12 (1.8 %), gout 8 (1.2 %), and peripheral vascular disease 4 (0.6 %). Gender and age-wise distribution of comorbidities is as shown in Table 2.

Clinical practice guidelines adherence

One hundred and ninety one patients (73.5 %) received CPG (2008) compliant therapy. CPG adherence was found to have a

statistically significant moderate negative association with LVH ($\Phi = -0.241$, $p < 0.01$), and diabetes mellitus ($\Phi = -0.228$, $p < 0.01$). No statistically significant association was found between CPG adherence and any other variable (Table 3).

Hypertension control

One hundred and fifty four (59.2 %) patients were on goal BP on visit 2 as compared to one hundred and twenty one (46.5) on 1st visit. Hypertension control was found to have

Table 3: Factors associated with clinical practice guidelines adherence

Variable	CPG adherence, N (%)		P-value	Effect size (Φ)
	Yes	No		
Prescription status	191 (73.5)	69 (26.5)		
DM			<0.001 ^a	-0.228
Yes	78 (62.9)	46 (37.1)		
No	113 (83.1)	23 (16.9)		
LVH			<0.001 ^b	-0.241
Yes	3 (25.0)	9 (75.0)		
No	188 (75.8)	60 (24.2)		

^a Chi square test; ^b Fischer Exact test; Φ Phi value; DM = diabetes mellitus; LVH = left ventricular hypertrophy

Table 4: Factors associated with hypertension control

Variable	BP control, N (%)		P-value	Effect size (Φ)
	Yes	No		
Patient status	154 (59.2)	106 (40.8)		
CPG compliance			0.005 ^a	0.175
Yes	123 (64.4)	68 (35.6)		
No	31 (44.9)	38 (55.1)		
LVH			0.017 ^b	-0.153
Yes	3 (25.0)	9 (75.0)		
No	151 (60.9)	97 (39.1)		
DM			0.017 ^a	-0.148
Yes	64 (51.6)	60 (48.4)		
No	90 (66.2)	46 (33.8)		
Monotherapy			0.007 ^a	-0.168
Yes	8 (33.3)	16 (66.7)		
No	146 (61.9)	90 (38.1)		
ACEI			0.002 ^a	-0.168
Yes	112 (66.3)	16 (66.7)		
No	42 (46.2)	90 (38.1)		

^a Chi Square test; ^b Fischer Exact test; Φ = Phi value; ACEI = angiotensin converting enzyme inhibitors; CPG = clinical practice guidelines; DM = diabetes mellitus; LVH= left ventricular hypertrophy

a statistically significant weak positive association with CPG compliance ($\Phi = 0.175$, $p < 0.01$) and ACE inhibitors ($\Phi = 0.195$, $p < 0.01$), while statistically significant weak negative association with LVH ($\Phi = -0.153$, $p = 0.017$), diabetes ($\Phi = -0.148$, $p = 0.017$) and monotherapy ($\Phi = -0.168$, $p < 0.01$). No statistically significant association was found between hypertension control and any other variable (Table 4).

DISCUSSION

In our study we found an overall fair level of adherence to medication recommendations of CPG (2008). More than two third (73.5 %) of the total prescriptions written were in compliance with CPG 2008. This finding is in contrast to some of the previous studies conducted elsewhere and Malaysia [11,12] which have reported poor adherence to guidelines, but is in compliance with some studies which have reported good adherence to guidelines [13,14]. This fair level of adherence to the hypertension guidelines might be due to the model proposed by Piette and Kerr [15].

According to the model, patients with concurrent comorbidities of overlapping pathophysiological pathways and management like hypertension and cardiovascular disease are more likely to receive guidelines adherent management. Similar guidelines recommended hypertension management was found to be significantly associated with patient total comorbidities, coronary artery disease, and history of myocardial infarction [16]. In the present study, CPG adherence was found to have negative association with diabetes mellitus and left ventricular hypertrophy. A similar report of doctors' poor compliance to hypertension guidelines while treating hypertension in diabetic patients was shown by another study conducted in Malaysia, where only 18.3 % of the diabetic hypertensive patients were on guidelines recommended ACE inhibitors [12]. In our study the possible reason for poor adherence to guidelines while treating diabetic hypertensive patients might be the fact that the clinic is a specialist clinic focusing on treating cardiovascular disease. However, a large-scale study in various cardiology clinics

will be needed to confirm this. Another possible reason for poor adherence with hypertension guidelines in patients with left ventricular hypertrophy might be due to the fact that only a single antihypertensive class, Angiotensin receptor blocker, is recommended by CPG (2008) as first choice, compared to the wider range of antihypertensive classes recommended for coronary heart disease and heart failure. In the present study, 7 (53.8 %) patients with left ventricular hypertrophy were receiving diuretics as compared to 4 (33.3 %) patients who were receiving guideline recommended angiotensin receptor blockers.

In our study, majority of patients (59.2 %) were at goal BP on the 2nd visit, a rate that was more than twice that of the Malaysian national bench mark of hypertension control (26.8 %) [7]. Hypertension control in our study was much higher than a recent multi-centre study conducted in Malaysia, in which 48.5 % of the patients had achieved BP control [17]. Reasons for this better hypertension control, compared to other studies conducted in Malaysia, might be the aggressive pharmacotherapy and doctors' greater compliance to hypertension guidelines. Similar better hypertension control in patients suffering from cardiovascular disease is reported by a study conducted elsewhere [18]. Better control of hypertension in patients suffering from cardiovascular disease might be due the fact that physicians seeing the patients with a critical disease pay more attention [19], and physicians and patients become more aware of the needs to maintain BP goal levels, once organ and vascular complications present [18].

Hypertension control had statistically significant positive association with CPG adherence and ACE inhibitors. Majority of the previous studies which have evaluated physicians' adherence to hypertension guidelines have not related practices to hypertension control. This finding was in compliance with the study conducted in Malaysia where adherence to recommended

practices resulted in better hypertension control [4]. The efficacy of ACE inhibitors in patients at high and lower risk of cardiovascular disease like those with coronary heart disease, congestive heart failure, cerebrovascular disease, chronic kidney disease, and diabetes has been demonstrated by several large clinical trials [20, 21]. Due to this reason ACE inhibitors are recommended by guidelines as choice of therapy in these conditions [3]. A majority of patients in our study were suffering from these conditions, so better control of hypertension in patients receiving ACEI was in compliance with guidelines recommendations and findings of the above stated trials.

Hypertension control was found to have statistically significant negative association with diabetes, left ventricular hypertrophy, and patients on monotherapy. Similar poor hypertension control in diabetic patients was reported by a study conducted in Malaysia, where only 3.1% diabetic hypertensive patients achieved the target BP of less than 130/80 mm Hg [12]. One possible reason for the negative association could be the more stringent BP goals (hypertension with diabetes mellitus and/or CKD <130/80 mm Hg, and with proteinuria > 1 g/24 h < 125/75 mm Hg) which are difficult to achieve in clinical settings [22]. Besides, this statistically significant negative association between CPG adherence and diabetes might have adversely affected hypertension control in diabetic patients, because of significant positive association between CPG adherence and hypertension control in our study. The negative association found between hypertension control and LVH seems to be a consequence of noncompliance to hypertension guidelines. This finding further strengthens the concept that adherence to hypertension guidelines leads to better hypertension control. The poor control of hypertension in patients receiving monotherapy as compared to polytherapy seems logical, because most of the patients were suffering from multiple comorbidities

and were in an age group in which BP control is normally achieved by using multiple antihypertensive drugs [3,23].

Limitations of this study

Conducting this study in a single site is the major limitation associated with our study. We evaluated prescribing practices only, and not the other components of hypertension management such as screening, life style interventions, pharmacotherapy and continued follow up. We followed patients for only one visit, hypertension is a chronic disease and needs a long observation period to decide whether the hypertension is controlled or not. However, to overcome this limitation we enrolled established hypertensive patients to make sure that BP reading noted on the 1st visit was the representative BP of the patient. The non-availability of certain anthropometric measurements like body weight, Body Mass Index (BMI), etc, and statements about patients' compliance to pharmacotherapy are the potential limitations associated with our study.

CONCLUSION

Overall prescribing practices were in fair compliance with guidelines, but still have a room for further improvement. Compliance to CPG 2008 resulted in better hypertension control in patients suffering from cardiovascular comorbidities. Poor adherence to guidelines in patients suffering from diabetes mellitus and LVH are the areas which need further probing and focus in the future. Different strategies like continuous medical education, seminars, reminder tools and the availability of clinical pharmacist to participate in collaborative practices and motivating patients to participate in BP goal achievement could increase guidelines adherence and hypertension control.

Conflict of Interest

The authors declare no conflict of interest, in part or whole. No funding was received for this study.

ACKNOWLEDGEMENT

The authors thank all the doctors and patients who participated in this study. Thanks are also due to the nursing and record keeping staff of Pulau Pinang Hospital, Malaysia

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