



Enhancing adherence to clinical practice guidelines for hypertension management: Evaluation of the effectiveness of a Hypertension Management Tool Kit (HMTK) among primary healthcare doctors. (ImprovBP-HMTK)

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ABSTRACT

Introduction: Adherence to guidelines in managing hypertension among primary healthcare doctors remains suboptimal.

Objective: We assessed the effectiveness of a Hypertension Management Tool Kit (HMTK) in improving guideline adherence.

Methods: Medical records of 392 patients attending 2 primary care clinics in the Klang district with 3 or more anti-hypertensive medications were audited. Paired T-test and repeated measure ANOVA were used to evaluate the effectiveness of the HMTK intervention with the evaluation of interaction within-subject effects, between subject effect and time.

Results: The mean MOGC score of doctors with <5 years of service was 79.765 (95 % CI 78.351,81.178) and with >5 years of service; 81.238 (95 % CI 80.621,81.855). Statistically significant (p-value <0.001) results were shown based on the time effect and mean MOGC score with HMTK; pre-intervention 72.426 (95%CI 71.045, 73.808) and post-intervention 88.576 (95 % CI 87.922, 89.230). The mean MOGC score post-intervention based on the time effect and years of service for both groups were statistically significant (p-value <0.001) and increment was shown in <5 years of service; 69.252 (14.915) to 87.149 (6.484) while >5 years of service; 73.485 (14.281) to 89.613 (5.149). Statistically significant was shown by years of service in time-group interaction effect pre- and post-intervention (p-value <0.001); pre-intervention for <5 years of service; 71.892 (95%CI 69.339,74.446) and >5 of service; 72.960 (95 % CI 71.895,74.075). Post-intervention in <5 years of service; 87.692 (95%CI 86.427,88.846) while >5 years of service; 89.516 (95%CI 88.987,90.044).

Conclusion: The HMTK is an effective tool to improve the management of hypertension among doctors.

1. What we already know

Nonadherence to clinical practice guidelines by doctors results in suboptimal care received by hypertensive patients attending health clinics. Various factors influence adherence to guidelines. Few studies explored the usage of a hypertensive clerking sheet and management algorithm in improving adherence to guidelines.

2. What this article adds

Our findings show that the HMTK is an effective tool for improving adherence to guidelines when managing patients with hypertension. Results suggest that there is a need for simplified primary care-based management algorithms when developing guidelines.

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3. Introduction

Hypertension is the foremost modifiable risk factor for cardiovascular disease and premature death globally.¹ Despite improvements in blood pressure (BP) measurement techniques and the availability of effective and safe anti-hypertensive drugs, a significant number of hypertensive patients remain undiagnosed, with a notable proportion of treatment still failing to achieve targeted BP control. This has increased morbidity and mortality due to cardiovascular complications resulting from uncontrolled hypertension.^{2,3}

In 2023 the World Health Organization (WHO) estimates that 1.28 billion adults worldwide have hypertension with increased prevalence in middle and low-income countries.⁴ Regardless of the geographic location only 60 % of hypertensive patients globally have controlled hypertension.⁵ In Malaysia the prevalence of hypertension based on the 2019 National Health and Morbidity Survey (NHMS) was 30 % and while there has been improvements in hypertension control through the years the control still remains less than 50 %.⁶ In essence, Malaysia's efforts to control hypertension still remain suboptimal to its desired targets.

More than 80 % of hypertension management in Malaysia occurs in public hospitals and clinics with barriers existing in the health system, healthcare providers, and patient factors all of which contribute to poor hypertension control.⁶ Approximately 66 % of suboptimal control of hypertension can be attributed to therapeutic inertia (failure to modify or titrate antihypertensive regime) among healthcare providers as well as their deviation from clinical practice guidelines.^{7,8} A qualitative study on among hypertensive patients care behavior revealed that patients only had partial adherence to their medication regime and this was attributed to insufficient monitoring and counselling from their healthcare providers. Additionally, patients expressed interest in more information on lifestyle changes that can be done to control their hypertension.⁹

The Ministry of Health Malaysia has undertaken the task of creating Clinical Practice Guidelines (CPG) for Hypertension Management.¹⁰ The objective is to aid healthcare providers the most recent evidence regarding effective management of hypertensive patients, including therapeutic approaches for specific subgroups of individual with high BP.¹⁰ Nonetheless both cross-sectional surveys and clinical audits focusing on the management of hypertension revealed non-adherence to guidelines resulting in patients not receiving the recommended process of care.^{11–14} Among barriers to healthcare provider's nonadherence to guidelines include the lack of awareness and knowledge of CPG and the perceived nonrelevance of guidelines, the format of the CPG which hindered its useability, and time constraints, especially in providing non-pharmacological advice during busy clinics' confounded with heavy patient loads.¹⁵

A comprehensive medical diagnosis hinges on a thorough clerkship, involving patient's history, physical examination and investigations all of which can be difficult in a busy public primary care setting.¹⁶ The lack of a standardized clerking sheet for hypertension in primary health clinics may result in failure of primary care doctors in assessing and managing patients in accordance to CPG guidelines. A study conducted among primary care physicians in China found that implementing a treatment algorithm could potentially enhance hypertension control and lead to reduced rates of hospitalization and stroke-related mortality, particularly in resource-constrained settings.¹⁷ Implementing a simplified treatment algorithm for hypertension has the potential to improve the existing hypertension care, improve blood pressure control rates, facilitate efficient and rational healthcare models and reduce medication cost.¹⁸

Considering the significant challenges and suboptimal management of hypertension in primary care this study aimed to assess the effectiveness of an interventional tool known as the Hypertension Management Tool Kit (HMTK) in enhancing guideline adherence and improving hypertension management among primary healthcare doctors.

4. Methodology

4.1. Study design, setting, and participants

This cross-sectional interventional study was done pre- and post-intervention on medical records of hypertensive patients with 3 or more antihypertensive medications. The Klang district was purposively selected from the nine districts in Selangor. Within the Klang district two health clinics, each with a daily attendance of 750 patients was selected. As a densely populated urban area with 1.1 million residents, Klang represents Malaysia's diversity encompassing all major ethnic groups, various economic statuses and health resources.

Phase 1 of the study involved the development of the Hypertension Management Tool Kit (HMTK) which consists of a Hypertension management algorithm, and Hypertension Clerking sheet. Phase two of the study involved an audit of medical records of hypertensive patients on 3 or more anti-hypertensive medications pre-and post-intervention. Medical records of patients aged 18 years and above who have been on treatment for at least 6 months with a clinical diagnosis of hypertension were included in the audit. Medical records of patients who were admitted due to hypertensive emergency (BP \geq 180/110 mmHg) during the time of the audit would be excluded.

4.2. Sample size

The desired sample size for this study was calculated using a single sample proportion for the dependent variable, and the derived formula is as below:¹⁹

$$n = \frac{Z_{1-\alpha/2} - \alpha/2 \cdot p_1 (1 - p_1)}{(d_2)}$$

$$Z_{1-\alpha/2} = 1.96 \text{ for } \alpha = 0.05$$

d = absolute precision (at 95 % CI or based on the width of confidence interval)

P1 = anticipated sample or population proportion derived from a study carried out among

The prevalence of uncontrolled hypertension among the adult Malaysian population (55 %) according to the National Health and Morbidity Survey 2019 was selected as a reference as it represents the Malaysian population.²⁰ The sample size calculated was **380** participants. The sample size was proportionately divided based on the attendance at the two respective clinics.

4.3. Data collection

Medical records of patients who fulfilled the research criteria were identified using systematic random sampling. Medical records were audited by the investigators using the audit checklist. Two cycles of the audit were conducted; one pre-intervention and one cycle post-intervention. The data collection method is described in Fig. 1 below.

4.3.1. Study Instrument

The intervention used for this pilot study includes 2 components known as the Hypertension Management Tool Kit (HMTK). The components include the Hypertension Management Algorithm, and Hypertension Clerking Sheet. The development of a quick reference hypertension management algorithm based on the Malaysian Hypertension CPG was placed in the consultation rooms of the doctors to assist them during the clinical consultation.¹⁰ This algorithm was reviewed by experts from the Malaysian Society of Hypertension, academicians with vast research in the field of hypertension, and members of the Malaysia Hypertension CPG committee.

The Hypertension Management Algorithm includes quick guide on

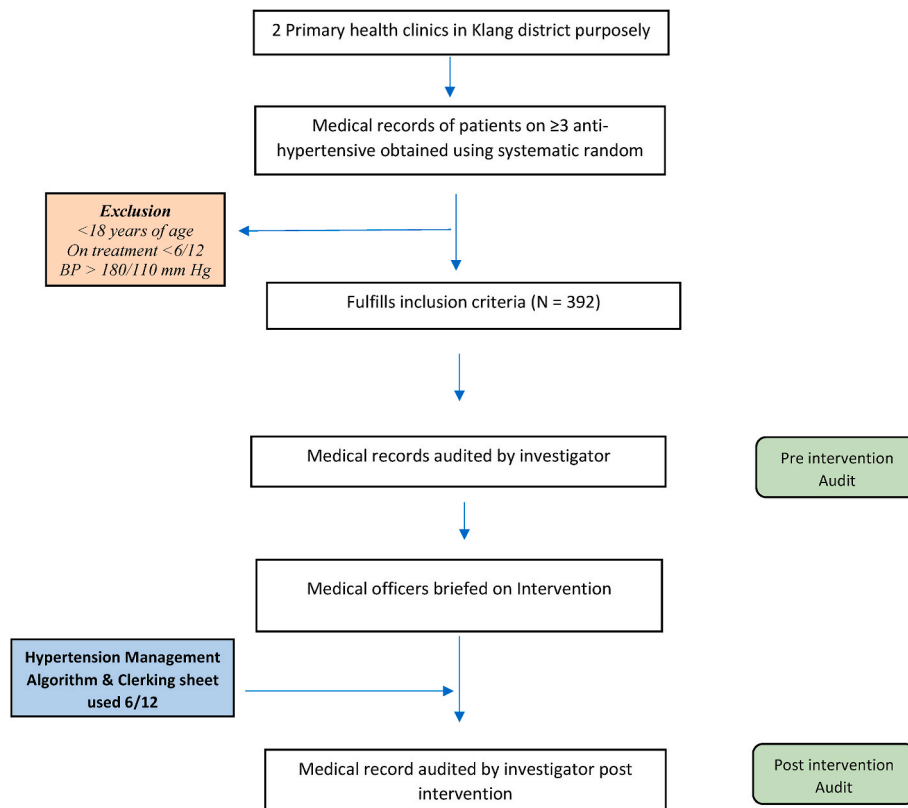


Fig. 1. Data collection method.

important history, examination, investigation, non-pharmacological advice and pharmacological management based on patients' diagnosis, target blood pressure to be achieved, and recommended medications based on guidelines.

The Algorithm also includes a guide on how to counsel patients to perform home blood pressure monitoring and indications on patients that should be referred to a primary care physician.

The second component is a Hypertension clerking sheet developed based on the hypertension algorithm which includes; registration in the hypertension registry, cardiovascular risk factor identification, history suggestive of target organ damage, examination, investigations to be done annually, both non-pharmacological and pharmacological management and health screening that can be offered to patients.

An audit checklist was developed to collect data on the doctor's adherence to CPG in the Management of Hypertension. The first section examined the auditee's duration of service in primary care. The second section examined the documentation of the medical officer's management based on the process of care according to the Model of Good Care (MOGC) in the Hypertension CPG.

5. Measurement of outcome variables

The main outcome variable of this study was the audit score of medical officers, which indicates the level of adherence to Hypertension CPG management. A score of 80 % or more was a good score, 79–51.1 % was a moderate score, and a score of 50 % or below was a poor score. A higher score will indicate a higher level of adherence.

The score was obtained from the sum of audit marks; i.e., 5 points from history, 6 points from physical examination, 4 points for investigation if patients hypertensive without diabetes and 3 points for investigation if hypertensive with diabetes, 3 points were given for management and 1 point for the documentation of blood pressure control whether controlled or uncontrolled. A maximum score of 18 for Hypertensive patients without Type 2 Diabetes and 17 for Hypertensive

patients with Type 2 Diabetes can be obtained.

The independent variable was the years of medical service of officers and the effectiveness of HMTK in improving adherence to Hypertension CPG.

5.1. Data analysis

Data entry and analysis was done using IBM SPSS statistic version 26.0. Frequencies and percentages were analyzed using descriptive analysis. For evaluation of the effectiveness of the HMTK intervention, repeated measure ANOVA was primarily the analytical method employed to understand if there was an interaction within-subjects effect (time effect), between-subjects effect (treatment effect regardless of time) and time (time-treatment interaction). Assumption of normality, homogeneity of variances, and compound symmetry were checked.²⁰ $P < 0.05$ were considered statistically significant.

6. Results

6.1. Sociodemographic characteristics and clinical audit components of MOGC pre-intervention

In all, 470 medical records of patients with ≥ 3 antihypertensive medications were reviewed. After exclusion, a total of 392 medical records fulfilled the criteria and were audited. The majority of the doctors (83.4 %) had more than five years of service. The majority of audited cards (53.4 %) were patients with hypertension and type II diabetes without proteinuria. In the clinical audit components, the majority of doctors did not enquire whether home blood pressure monitoring was performed by patients (58.7 %), did not provide non-pharmacological advice (65.8 %) and there was no documentation on blood pressure control (50.8 %). However, the majority of doctors calculated the patient's body mass index (BMI) (61.0 %), performed blood pressure checks twice (63.3 %), annual urine examination orders (71.9 %) and

correctly prescribed medications according to the clinical practice guidelines in the management of hypertension (94.5 %) (Refer Table 1).

6.2. Effectiveness of intervention in improving mean audit scores based on time

Results from repeated measures ANOVA revealed the effectiveness of the intervention (Hypertension algorithm and Clerking sheet) based on time effect had shown a significant difference (p-value <0.001) of mean MOGC score of pre- and post-intervention; pre-intervention 72.426 (95%CI 71.045, 73.808) and post-intervention 88.576 (95 % CI 87.922, 89.230). (Refer Table 2).

Findings on the interaction between time and years of service had shown significant difference (p-value <0.001) of mean MOGC score post-intervention in both groups of doctors. The mean in doctors with <5 years of duration of service pre-intervention group was 69.252 (14.915) and post-intervention 87.149 (6.484). The mean in doctors with more than five years of duration of service in the pre-intervention group was 73.485 (14.281) and post-intervention 89.613 (5.149) (Refer Table 2).

The effectiveness of intervention when compared to doctors' years of service was not significant (p-value <0.063) to improve the mean MOGC score in both groups of doctors. The mean in doctors with <5 years of duration of service was 79.765 (95 % CL 78.351,81.178) while the mean in doctors with >5 years of duration of service was 81.238 (95 % CI 80.621,81.855) (Refer Table 3).

The comparison of MOGC scores of medical officers by years of service in time-group interaction effect pre- and post-intervention showed significant difference (p-value <0.001) The mean in pre-intervention among doctors with <5 years of duration of service was

Table 1
Sociodemographic characteristics and clinical audit components of MOGC pre-intervention.

Factor	Frequency (N = 392)	Percentage (%)
Sociodemographic		
Years of Service		
Less than 5 years	65	16.6
5 years and more	327	83.4
Clinical Diagnosis of Audit cards		
Hypertension alone	62	15.8
Hypertension and Type II Diabetes without proteinuria	213	54.3
Hypertension and Others ^a	117	29.8
Clinical Audit component		
Enquires on Home blood pressure monitoring		
Not done	162	58.7
Done	230	41.3
Calculating Body Mass Index (BMI)		
Not done	153	39.0
Done	239	61.0
Blood pressure check done twice		
Not done	144	36.7
Done	248	63.3
Annual urine examination order		
Not done	110	28.1
Done	282	71.9
Providing Non-Pharmacological Advice		
Not done	257	65.8
Done	134	34.2
Pharmacological management		
Incorrect	20	5.1
Correct	327	94.9
Documentation on Blood pressure control		
Not Done	199	50.8
Done	193	49.2

^a Type II Diabetes Mellitus with proteinuria, Chronic Kidney Disease, Cerebro Vascular Accident, Heart disease.

71.892 (95%CI 69.339,74.446) while among doctors with more >5 of service was 72.960 (95 % CI 71.895,74.075). The mean in post-intervention among doctors with <5 years of duration of service was 87.692 (95%CI 86.427,88.846) while in doctors with >5 years of service was 89.516 (95%CI 88.987,90.044). (Refer Table 4).

7. Discussion

Our study findings show that prior to intervention the mean audit score on the management of hypertension was moderate which improved to good with the usage of HMTK. Findings also show that usage of the HMTK over time improves audit scores indicating improved adherence to CPG overtime. Most notably, HMTK is effective both among junior doctors (<5 years of service) and senior doctors (5 years of service) with improved mean audit scores over time. The improvement in mean audit scores was more evident among senior doctors when compared to the junior doctors' overtime.

Findings of this clinical audit pre intervention were similar to other audits done which showed gaps in the process of care, however our study is the first to identify components which influence the score which include enquiring on home BP monitoring, calculating BMI, measuring blood pressure twice, annual urine examination, correct pharmacological management and documentation of hypertension control.^{11,14,21} Strategies to improve audit scores should be targeted towards these key aspects during clinical consultation.

Inquiring about home blood pressure is crucial to enhance blood pressure management, as evident in systematic review that indicate higher likelihood of reducing anti-hypertensive medication and reduced therapeutic inertia among healthcare providers.^{22,23} The HMTK not only provides guidance on how to advice patients to perform home blood pressure monitoring but also includes a reminder to inquire about home blood pressure reading within its patient clerking sheet. Reasons why healthcare providers do not enquire on home BP monitoring should be explored and strategies to overcome such barriers should be addressed.

Studies show doctors knowledge on guidelines, past clinical experience, beliefs about guidelines, outcome expectations and guideline characteristics all influence guideline adherence in particular towards pharmacological management.^{24,25} Non adherence to CPGs also occur due to the complexity and lack of user friendliness of the CPG.^{26,27} The current CPG for Management of Hypertension while comprehensive and detailed, might pose a usability challenge for primary care doctors in their daily clinical practice. These factors could have contributed to the suboptimal score among doctors in this study prior to the usage of HMTK in managing patients with hypertension. It appears that integrating the use of the HMTK can effectively address the challenges as it offers guidance on the necessary steps for managing patients with uncontrolled hypertension, encompassing history, examination, investigation and required treatment and improving audit scores. The HMTK has the potential over time to improve hypertension control among patients and be cost saving.^{27,28}

Our study does have certain limitations. First, the evaluation of HMTK's effectiveness was restricted to just two primary healthcare clinics in Klang. However, the feasibility demonstrated here could serve as a foundation for a more extensive study. Additionally, our research concentrated on patients using three or more antihypertensive medications, and outcomes might vary when dealing with patients prescribed fewer anti-hypertensive medications. Furthermore, we did not assess the impact of HMTK on hypertension control or the cost saving in antihypertensive medication usage following the intervention. The major strength of this study lies in the creation of the HMTK, specifically designed for the constraints of a busy primary care clinic with limited human resources, diagnostic options and anti-hypertensive. To the best of our knowledge, this study represents the first attempt to introduce an intervention aimed at improving the care process for managing hypertensive patients in primary care setting.

This study holds significant policy implications, given that our

Table 2

Comparison of MOGC scores of medical officers pre- and post-intervention (Time effect with and without group comparison).

Comparison	Without group comparison		With group comparison			
	MOGC scores		<5 years of service		>5 years of service	
	Adjusted Mean (95 % CI)	p-value	Mean (SD)	p-value	Mean (SD)	p-value
Pre-intervention	72.426 (71.045, 73.808)	<0.001	69.252 (14.915)	<0.001	73.485 (14.281)	<0.001
Post-intervention	88.576 (87.922, 89.230)		87.149 (6.484)		89.613 (5.149)	

Table 3

Effectiveness of Intervention on mean MOGC scores of the medical officers based on years of service (Group effect regardless of time).

Comparison	Adjusted Mean (95 % CI)	F-stat	p-value
<5 years of service	79.765 (78.351,81.178)	3.469	0.063
>5 years of service	81.238 (80.621,81.855)		

Table 4

Effectiveness of Intervention on mean MOGC scores of medical officers by years of service pre- and post-intervention (Time-Group interaction effect).

Comparison	Group	Adjusted Mean (95 % CI)	p-value
Pre-intervention	<5 years	71.892 (69.339,74.446)	0.031
	>5 years	72.960 (71.895,74.075)	
Post-intervention	<5 years	87.692 (86.427,88.846)	0.001
	>5 years	89.516 (88.987,90.044)	

findings underscore the HMTK's efficacy in enhancing adherence to guidelines for managing hypertensive patients. The HMTK can be integrated into clinics through utilization of a standardized clerking sheet and management algorithm designed to assist primary care doctors. Future CPG for Hypertensive Management, should consider a concise management algorithm that incorporates history, examination, investigation, and evidence-based treatment options customized for primary care patients. There remains a crucial necessity to bolster the knowledge of doctors in primary care, particularly emphasizing the importance to adherence to guidelines in hypertension management.

8. Conclusion

In conclusion, we identified key factors that contribute to the sub-optimal management of hypertensive patients in primary care. The HMTK provides evidence that the use of a customized guideline-specific intervention can lead to improved guideline adherence and an enhanced care process for hypertensive patients. Policymakers should consider the adoption of a standardized clerking sheets and management algorithms in primary care clinics. Our results emphasize the need to place greater emphasis on usability and acceptability when designing guidelines for primary care.

Availability of data material

Data collected from this study can be obtained from the corresponding author upon reasonable request.

Ethical information

Ethical approval to conduct this study was obtained from the Medical Research Ethics Committee of Malaysia. (NMRR ID-22-00955-EWF (IIR)) and followed current regulations on the protection of personal data where no personal data was collected from medical records.

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Author's Contribution statement

A.M and S.M.I were involved in the conception and methodology of the study. A.M, B.N.L.J and H.M.D performed the data analysis and interpretation of data. All authors were involved in data collections and contributed to the drafting, editing and revisions of the manuscripts. All authors approved the final version.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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