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Family and internal medicine resident's awareness of and adherence to the Joint National Committee 8 (JNC 8) hypertension guidelines: A cross-sectional study.

Najla A. Alshehri, Turky H. Almigbal, Abdulaziz Alodhayani, Mohammed Ali Batais*

Department of Family and Community Medicine, King Saud University, Riyadh, Saudi Arabia

Abstract

Background: Various hypertension management guidelines have been published, disseminated and regularly updated to improve hypertension control. Poor adherence to clinical practice guidelines has been a growing concern and shown to be a contributor to poor quality of care and health outcomes.
Objective: This study aims to assess the awareness and adherence of family and internal medicine residents to the recommendations of JNC 8 guidelines and to identify associated residents' characteristics.
Study design: This study used a cross sectional design. The study participants were all trained male and female family and internal medicine residents working at King Saud University Medical City in Riyadh. They were recruited between February 2016 and April 2016 by using a self-administered questionnaire. The questionnaires were distributed to the residents by convenience sampling technique.
Result: A total of 109 residents completed a self-administered questionnaire (response rate 90.8%). One-hundred seven residents (98%) were aware of the JNC 8 guidelines for the management of hypertension. The overall adherence of residents to all recommendations was (88.1%). Though not statistically significant, except for recommendations 7 and 9, family medicine residents showed more adherences to most of the JNC8 recommendations than did internal medicine residents (8 out of 10 recommendations). However; there were no significant associations between resident's adherence and all demographic characteristics variables.
Conclusion: Our study shows that the residents had a high level of awareness of the JNC 8 hypertension guidelines. Nevertheless, awareness of the guidelines does not necessarily lead to full adherence to the guidelines.

Keywords: JNC 8, Hypertension, Adherence, Awareness, Practice, Family physicians, Family medicine residents, Primary care physicians, Internal medicine physicians, Internal medicine residents.

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Introduction

Hypertension (HTN) is a major global health problem and an important risk factor for Cardiovascular Disease (CVD) [1,2]. It affects more than a quarter of the worldwide adult population, including the Kingdom of Saudi Arabia (KSA). In 2025, the HTN prevalence is projected to increase by 24% in developed countries and 80% in developing countries [3].

The goal of HTN management is to reduce both morbidity and mortality by preventing renovascular, cardiovascular, and cerebrovascular diseases. The adequate control of Blood Pressure (BP) was associated with a reduction in coronary heart disease by approximately 22 %, [4] and 28-38% risk reduction in stroke incidence [5].

Various HTN management guidelines have been published, disseminated, and regularly updated to improve HTN control. In 2013, the eighth Joint National Committee report for the management of high BP (JNC 8) was published [6]. JNC 8 offers clinicians evidence-based recommendations toward BP management [6]. JNC 8 recommendations are based on Randomized Control Trials' (RCTs) evidence, which differs from other currently used guidelines supported by observational studies and expert agreement [7].

Poor adherence to clinical practice guidelines has been a growing concern and shown to be a contributor to poor quality of care and health outcomes as well as increased risks with subsequent adverse events [8]. Barriers to guidelines' implementation have been identified, including physicians' lack of familiarity, disagreement with some of the guidelines' recommendations, and poor adherence [9].

In spite of the positive effect of guidelines' implementation on HTN control, existing evidence suggests that hypertensive patients are still not adequately managed according to the guidelines [10]. It has been shown that physicians' attitudes

and behaviors toward HTN management and deviation from the clinical practice guidelines contribute to more than two thirds of the poor control of HTN [11]. In the Hypertension Evaluation Project (HEP I), the awareness and the knowledge of the recommendations of national HTN guidelines among German practitioners was less than 25% [12]. In southern Sweden, a study targeted General Practitioners (GPs) showed that there was a lack of GPs' adherence to HTN guidelines, and there are both under- and over-treated hypertensive patients [13].

In the Kingdom of Saudi Arabia (KSA), there has been a deficiency in the control of HTN as well as physicians' practice despite the significant advancement in the management [14,15]. Many Primary Healthcare (PHC) physicians lack the essential knowledge to define and diagnose HTN, particularly among patients with diabetes. In addition, most of the PHC physicians did not adhere to the seventh Joint National Committee (JNC 7) guidelines of HTN management [14].

To have consistency between the recommendations in the guidelines and patient care, physicians must be aware of and adhere to the recommendations [16]. Although training residents can provide a high quality of care for managing chronic diseases in outpatient settings [17], it is still not clear whether that practice extends to HTN management. Specifically, residents' awareness and adherence to recent JNC 8 HTN guidelines during their training is still largely unknown. As the practice patterns obtained during residency training are more likely to be the basis for lifelong practice, a better understanding of these patterns is required [18]. Furthermore, if the practice and adherence of the residents to the guidelines' recommendations are suboptimal, then it may indicate the need to change the resident's practices as well as provide education. Therefore, this study was performed to assess the awareness and adherence of family and internal medicine residents to the recommendations of the JNC 8 guidelines in Riyadh and to identify associated residents' characteristics.

Methodology

Study design

This study used a cross-sectional design among family and internal medicine residents. All available 120 residents were approached, complete questionnaire responses were returned by 109 residents (response rate 90.8%), and the questionnaires were distributed to the residents using a convenience sampling technique. The residents were approached by the principal investigator (NA) during the academic half-day release activity held on a weekly basis and they were invited to participate in the study and to complete a self-administered questionnaire.

Subjects and setting

This study was conducted at the King Saud University Medical City in Riyadh, Saudi Arabia, a major teaching hospital in the area with a capacity of 800 beds that provides residency training programs in various specialties, including family and internal medicine residency programs. The study participants were all trained male and female family and internal medicine residents working at King Saud University Medical City in Riyadh. They were recruited between February 2016 and April 2016 using a self-administered questionnaire.

Survey instrument

A structured English language questionnaire was developed by the principal investigator, family medicine resident after an extensive review of the published literature and based on the evaluation of JNC 8 hypertension guidelines to assess the residents' awareness and adherence to the recommendations of the JNC 8 guidelines concerning the care of hypertensive patients [6]. To ensure content and face validity, two family physicians/researchers familiar with survey development assessed the questionnaire for its appropriateness, accuracy, and relevance. Some changes were then made. A pilot test was then performed on 10 family physicians at King Saud University Medical City to assess the clarity of the questionnaire and the time needed to complete it, thereby contributing to the face validity of the questionnaire.

The questionnaire consisted of two sections; the first section compiled residents' demographic information, such as age, gender, nationality, marital status, residency program, and residency level. It also includes questions on the total number of hypertensive patients seen by the resident in a week, the proportion of hypertensive patients among all patients seen, and the awareness of the JNC 8 guidelines. The second section assessed the residents' adherence to the JNC 8 guidelines' recommendations. JNC 8 has nine recommendations about the management of hypertension. Because recommendation 9 is very long, it has been divided into two recommendations, which makes a total of 10 recommendations in this study (Table 1) [6].

Table 1. *Recommendations of JNC 8 guideline assessed in the questionnaire.*

Recommendation 1	In the general population aged ≥ 60 y, initiate pharmacologic treatment to lower blood pressure (BP) at systolic blood pressure (SBP) ≥ 150 mmHg or diastolic blood pressure (DBP) ≥ 90 mmHg and treat to a goal SBP<150 mmHg and goal DBP<90 mmHg.
Recommendation 2	In the general population<60 y, initiate pharmacologic treatment to lower BP at DBP ≥ 90 mmHg and treat to a goal DBP<90 mmHg.
Recommendation 3	In the general population<60 y, initiate pharmacologic treatment to lower BP at SBP ≥ 140 mmHg and treat to a goal SBP<140 mmHg.

Recommendation 4	In the population aged ≥ 18 y with Chronic Kidney Disease (CKD), initiate pharmacologic treatment to lower BP at SBP ≥ 140 mmHg or DBP ≥ 90 mmHg and treat to goal mmHg and goal DBP<90 mmHg. SBP<140
Recommendation 5	In the population aged ≥ 18 y with diabetes, initiate pharmacologic treatment to lower BP at SBP ≥ 140 mmHg or DBP ≥ 90 mmHg and treat to a goal SBP<140 mmHg and goal DBP<90 mmHg.
Recommendation 6	In the general nonblack population, including those with diabetes, initial antihypertensive treatment should include a thiazide-type diuretic, CCB, ACEI, or ARB.
Recommendation 7	In the general black population, including those with diabetes, initial antihypertensive treatment should include a thiazide-type diuretic or CCB.
Recommendation 8	In the population aged ≥ 18 y with CKD, initial (or add-on) antihypertensive treatment should include an ACEI or ARB to improve kidney outcomes. This applies to all CKD hypertension regardless of race or diabetes status.
Recommendation 9	If goal BP is not reached within a month of treatment, increase the dose of the initial drug or add a second drug from one of the classes (thiazide-type diuretic, CCB, ACEI, or ARB).
Recommendation 10	If goal BP cannot be reached with 2 drugs, add and titrate a third drug from the list provided. Do not use an ACEI and an ARB together in the same patient.

CCB: Calcium Channel Blocker; ACEI: Angiotensin Converting Enzyme Inhibitor; ARB: Angiotensin Receptor Blocker.

Ethical considerations

Ethical approval was obtained from the Institutional Review Board, College of Medicine, King Saudi University (no. E-15-1698), where the data were collected. Physicians were invited to participate in the study after the objectives were explained. They were reassured of the confidentiality of the collected information. The return of a completed survey was assumed to imply consent.

Data processing and analysis

The data from each of the returned questionnaires were coded and entered into Statistical Package for the Social Sciences (SPSS) version 21 software (SPSS Inc., Chicago, IL, USA), which was used for statistical analysis. Descriptive statistics, including frequency distributions and percentages, were applied to both the demographic data and responses to the questions. Residents were classified as "unaware of the guidelines" if they answered "never knew" on the question on familiarity with the guideline. They were considered to adhere to the recommendations when they "always" or "more than half of the time" applied it in their clinical practice using an awareness-adherence model [16]. The chi-square test was then used to examine differences in the proportion of adherence to JNC 8 recommendations between family and internal medicine residents. To measure the overall adherence to all recommendations, the continuous scale was converted to a nominal scale to dichotomize adherent and non-adherent physicians. Those who scored 1-20 were considered non-adherent (never and less than half of the time), while those who scored 21-40 were considered adherent (always and more than half of the time). Then, the chi-square was used to assess the relationship between residents' demographic characteristics and the overall adherence. A P-value of less than 0.05 was considered statistically significant for all analyses.

Results

A total of 120 residents were approached; of the 120 residents who participated, complete questionnaire responses were returned by 109 residents (response rate 90.8%). The overall questionnaire reliability coefficient (Cronbach's alpha) was 0.84.

The socio-demographic characteristics of the residents are shown in Table 2. The mean age of the residents was 27 ± 2.6 y, 59 (54%) were males and 50 (46%) were females. Around half of study participants (51%) were single, and (48%) were married. Internal Medicine (IM) residents contributed to approximately two-thirds of the study sample (64%), while (36%) were Family Medicine (FM) residents. All years of residency were included, where year 3 residents (R3) representing the highest percentage (34%), followed by year 2 (R2) (27%), year 1 (R1) (26%), and year 4 (R4) (14%). The mean of hypertensive patients seen by the residents in a week was 14.6 ± 12, with (42%) of the residents reported that among all patients seen, 10-30% were hypertensive patients. One-hundred seven residents (98%) were aware of the JNC 8 guidelines for the management of high BP in adults.

Table 2. *Demographic characteristics of the study sample (n=109).*

Characteristics	No (%)	Mean (SD)
Age		27 ± 2.6
Gender		
Male	59 (54%)	
Female	50 (46%)	
Marital status		
Single	56 (51%)	
Married	52 (48%)	
Divorced	1 (1%)	
Residency program		

Family medicine	39 (36%)	
Internal medicine	70 (64%)	
Residency level		
R1	28 (26%)	
R2	29 (27%)	
R3	37 (34%)	
R4	15 (14%)	
Number of patient seen in a week		14.60 ± 12.039
Proportion of HTN patients among all patients seen		
<10%	2 (2%)	
10-30%	46 (42%)	
30-50%	37 (34%)	
>50%	24 (22%)	
JNC8 Guideline awareness*		
Never knew	2 (2%)	
Heard but never had a copy	5 (5%)	
Had but never read the consensus	30 (28%)	
Has read and implemented it	72 (66%)	

N: Number. *The responders were classified as unaware of the guideline if they answered "never knew"

Table 3. *Resident's adherence to JNC 8 recommendations (n=109).*

Recommendation	FM (n=39) No (%)*	IM (n=70) No (%)*	Total (n=109) No (%)*	P-value**
Recommendation 1	29 (74.4)	53 (75.7)	82 (75.2)	0.87
Recommendation 2	29 (74.4)	44 (62.9)	73 (67)	0.22
Recommendation 3	31 (79.5)	49 (70)	80 (73.4)	0.28
Recommendation 4	28 (71.8)	43 (61.4)	71 (65.1)	0.27
Recommendation 5	30 (76.9)	55 (78.6)	85 (78)	0.84
Recommendation 6	30 (76.9)	51 (72.9)	81 (74.3)	0.64
Recommendation 7	34 (87.2)	49 (70)	83 (76.1)	0.04
Recommendation 8	31 (79.5)	49 (70)	80 (73.4)	0.28
Recommendation 9	32 (82.1)	44 (62.9)	76 (69.7)	0.03
Recommendation 10	27 (69.2)	47 (67.1)	74 (67.9)	0.82
Average (%)	77.20%	69.20%	72%	

FM: Family Medicine; IM: Internal Medicine. *The data are the Number (N) and percentages of residents who adhere to each recommendation. Residents were considered to be adhered to the recommendation when they selected "always" or "more than have of the time. **Chi-square: test was used in the analysis

Table 4. *The relationship between resident's demographic characteristics and the overall adherence.*

Characteristics	Non-adhered** n= 13 (11.9%) No (%)	Adhered** n=96 (88.1%) No (%)	P value
Age			
Below 30	8 (61.5%)	74 (77.1%)	
30 and above	5 (38.5%)	22 (22.9%)	0.302
Gender			
Male	52 (54.2%)	7 (53.8%)	0.983
Female	44 (45.8%)	6 (46.2%)	
Marital status			
Single	51 (53.1%)	5 (38.5%)	0.547
Married	44 (45.8%)	8 (61.5%)	
Divorced	1 (1%)	0	
Residency program			

Family medicine	35 (36.5%)	4 (30.8%)	0.688
Internal medicine	61 (63.5%)	9 (69.2%)	
Residency level			
R1	25 (26%)	3 (23.1%)	0.892
R2	25 (26%)	4 (30.8%)	
R3	32 (33.3)	5 (38.5%)	
R4	14 (14.6)	1 (0.9%)	
Number of hypertensive patients seen in a week			
12 patients and less	47 (49%)	8 (61.5%)	0.395
More than 12 patients	49 (51%)	5 (38.5%)	
Proportion of HTN patients among all patients seen			
<10%	2 (2.1%)	0	0.202
10-30%	37 (38.5%)	9 (69.2%)	
30-50%	35 (36.5%)	2 (15.4%)	
>50%	22 (22.9%)	2 (15.4%)	
JNC8 Guideline awareness*			
Unaware	1 (1%)	1 (7.7%)	0.225
Aware	95 (88.8%)	12 (11.2%)	

N: number. *The responders were classified as unaware of the guideline if they answered "never knew". Data represents overall adherence to all recommendations, those who scored 1-20 were considered non-adherent (never and less than half of the time), while those who scored 21-40 were considered adherent (always and more than half of the time). [!]Chi square test was used in the analysis.

A comparison of residents' adherence by specialty to each JNC 8 guideline recommendation is presented in Table 3. Adherence among all residents varied between 65.1% to 78%, with an average of 72%. The least adherence (65.1%) was to recommendation 4 to initiate pharmacologic treatment in the population aged ≥ 18 years with chronic kidney disease to lower BP to goal of less than 140/90. However, 78% of the residents were adherent to recommendation 5 to initiate pharmacologic treatment in the diabetes population. Family medicine residents showed more adherence to most of the JNC 8 recommendations than did internal medicine residents (8 out of 10 recommendations). For instance, FM residents were more adherent to recommendations 2 and 3 to initiate pharmacologic treatment for adult<60 y to a lower BP at BP ≥ 140/90mmHg and treat to a goal BP<140/90 mmHg than did IM residents (74.4% *vs.* 62.9 % (P=0.22), 79.5% *vs.* 70% (P=0.28)) respectively. In addition, 82.1% of FM residents were more adherent to increase the dose of the initial drug or add a second drug from one of the classes (thiazide-type diuretic, CCB, ACEI, or ARB) if the goal BP was not reached within a month of treatment than IM residents (62.9%) (P=0.03). The highest adherence (87.2%) among the FM residents was to recommendation 7 targeting the general black population, including those with diabetes (P=0.04), while the highest adherence (78.6%) among IM was to recommendation 5 targeting the general population aged ≥ 18 y with diabetes (P=0.84). The lowest adherence among FM residents was to recommendations 10 and 4 (69.2% and 71.8%), while among IM residents it was to recommendation 4 (61.4%).

The overall adherence of residents to all recommendations was (88.1%). Table 4 However, there were no significant associations between residents' adherence and all demographic characteristics variables.

Discussion

This is the first formal survey of residents' awareness and adherence to the JNC 8 guidelines. Therefore, most of the comparisons in this review were dated and refer to older versions of the JNC HTN guidelines, as the most recent JNC 8 was just recently published in 2014. This study shows that the awareness of the JNC 8 HTN guidelines among family and internal medicine residents was quite high (98.2%). These findings are consistent with other studies among various HTN guidelines [19-21]. The high awareness and familiarity of the residents to the guidelines is most likely due to implementation and dissemination of the guidelines by the program structure for the residents and to a high prevalence of HTN that makes the residents more aware of the recent guidelines' recommendations.

Despite this high awareness, the overall adherence to all the guidelines' recommendations was (88.1%) among all residents. However, previous studies have reported various findings. In

South Africa, there was suboptimal adherence among most of the general practitioners to the HTN guidelines suggested by the JNC 6 [22]. Similarly, in Kuwait most family physicians did not fully adhere to all HTN guidelines despite the fact that 92.1% of them agreed to apply them in the practice [23]. Moreover, in Saudi Arabia, primary care physicians did not fully adhere to all JNC 7 hypertension guidelines [14]. Possible explanations for our study findings could be the inadequate time available for residents to read and remember the complete details of all guidelines, especially with the existence of several guidelines and the volume of their recommendations [24]. In addition, applying the recommendations may be impractical in various clinical settings due to inadequate consultation time, the deficiency of local resources, or the absence of attention to the logistics of implementation [24,25].

In this study, we found that the overall adherence of FM residents was superior to that of IM residents. Specifically, the adherence to the prescription of second-line treatment or increasing the dose of the initial drug when indicated was high among family physicians compared to internists (82.1% *vs.* 62.9%) (P=0.03). Such a comparison between family and internal medicine residents' adherence to the JNC 8 guidelines had not been addressed previously. However, amongst public service doctors, the adherence to such recommendations was reported by 73.5% [22]. In contrast, adherence data were reported in another study in Saudi Arabia to be only 17.7% [14]. One possible explanation for our study findings could be attributed to the fact that family physicians have more opportunities to manage hypertensive patients in their clinics during their training programs and also may be because HTN is more common in primary care settings. Furthermore, most of the issues dealt with in the guidelines are routinely available in family clinic practice.

When it comes to patients with uncontrolled BP and additional comorbidities, providers have not been following the guidelines' recommendations, despite the fact that the JNC guidelines have specific recommendations for treating those patients with diabetes and Chronic Kidney Disease (CKD) [26]. In this study, we found the least adherence (65.1%) with the recommendation to initiate pharmacologic treatment in the population aged ≥ 18 y with CKD to lower the BP to goal of less than 140/90. Previous study has reported that physicians' awareness and understanding about the management of CKD are inadequate, and CKD is generally undertreated [27]. Therefore, the barriers and reasons why residents are not following such recommendations must be identified when treating those with CKD, as their HTN contributes to the state of their comorbidities and increases the risk of progression [28].

Strengths and Limitations of the Study

Our study supports the usefulness of the awareness to an adherence model and affords valuable information on the implementation of an important guideline in Saudi Arabia. Still, some parts of this study, especially the sample size and the use of a self-administered questionnaire, need further consideration. The sample size of the study population in both groups was small, which could make the percentages misleading. Moreover, a self-report survey is one of the most simple and low-cost methods of measuring adherence. However, it has numerous limitations, such as social desirability bias as well as recall bias, which lead to overestimation [29]. The recruitment of residents from a large training tertiary hospital (capital city of Saudi Arabia) was perceived as more practical, although it might not be representative of residents who do not have the opportunity to train in such an institute. However, training programs in different regions of Saudi Arabia have a standard educational curriculum and objectives. Further studies are recommended to assess residents' awareness and adherence to the JNC 8 guidelines among training residents in different institutes of Saudi Arabia.

Implications for Future Research and Clinical Practice

Possible barriers to the use of guidelines' recommendations among physicians have been identified previously; however, most studies have examined only one type of barrier. Disagreement with some of the recommendations, the absence of motivation, reluctance to change the therapy, a lack of outcome expectancy, a high number of patients seen, and inadequate consultation time, all have been reported as barriers to guideline adherence [13,14,22,24]. The model of awareness-to-adherence used in this study may help to identify residents' specific gaps regarding the implementation of the various guidelines in practice [30]. If the adherence of some recommendations is suboptimal, further analysis of the possible barriers and concerns is more likely to be needed; this might include pilot questioning of residents to explore their likely cognitive and practical difficulties requiring the adaptation of a given recommendation. Therefore, we recommend such barriers to be studied in the future to supplement the findings of this study.

Conclusions

The residents in our study had a high level of awareness of the JNC 8 hypertension guidelines. Nevertheless, awareness of the guidelines does not necessarily lead to full adherence to the guidelines. The production and dissemination of guidelines are not sufficient to warrant that research evidence being put into practice. Improvements in clinicians' awareness and adherence to guidelines need to be incorporated into strategies to improve adherence.

Conflict of Interest

The authors have declared that no competing interests exist.

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*Correspondence to

Mohammed Ali Batais

Department of Family and Community Medicine,

King Saud University,

Riyadh,

Saudi Arabia