Prevalence of Uncontrolled Blood Pressure in Hypertensive Patients Attending The Primary Care Unit of Songklanagarind Hospital

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Abstract:

Objective: To evaluate the prevalence of uncontrolled hypertension based on the Thai Guideline on the Treatment of Hypertension 2012, the 7th report of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC7) and its recently released version, 8th Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC8).

Material and Method: We screened 1,311 hypertensive patients who visited the Primary Care Unit at Songklanagarind Hospital from October to December 2013. The outcome of this cross-sectional study was the prevalence of uncontrolled hypertension based on the Thai Guideline on the Treatment of Hypertension 2012, JNC7 and JNC8.

Results: The study included a total of 1,181 patients. The prevalences of uncontrolled hypertension were 57.2%, 53.4% and 30.0%, based on the Thai guidelines, JNC7 and JNC8, respectively.

Conclusion: The prevalence of uncontrolled hypertension in our setting remained unsatisfactory.

Keywords: JNC7, JNC8, Primary Care Unit, uncontrolled hypertension

Introduction

A report from the Bureau of Non-Communicable Disease of Thailand[1] which stated that the prevalence per 100,000 of hypertensive individuals rose from 287.5 in 2001 to 1433.61 in 2011 which is an increase of 5 times and seems to continue to increase. Though evidently large in magnitude, only 55.6% of Thai patients are aware of their hypertensive status and among those only 43.1% of treated patients have their blood pressure controlled. Globally, there have been a number of studies regarding the prevalence of uncontrolled hypertension as shown in Table 1. These papers are based on populations of different races, ethnicities, health care systems and health problem status. In this article, we reviewed the prevalence of uncontrolled hypertension and the patient characteristics in the Primary Care Unit of Songkla-nagarind Hospital. We describe the current magnitude and the trends of hypertension treatment according to the Thai Guideline on the Treatment of Hypertension,[2] the 7th Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC7) guideline[3] and the 8th Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (JNC8) guideline.[4] We also examined the clinical correlates of uncontrolled hypertension and appraised the patient-related and physician-related factors related to poor control of blood pressure.

Definitions of hypertension

Hypertension is defined as systolic blood pressure >140 mmHg or diastolic blood pressure >90 mmHg.[3] Appropriate blood pressure levels for specific groups of patients vary from guideline to guideline. In 2012, the Thai Hypertension Association proposed a blood pressure of <140/90 mmHg for the normal population, <140/85 in diabetic patients, <130/80 in young adults (<30 years old).[2] Additionally, the JNC7 suggests a blood pressure <140/90 mmHg in normal adults, <130/80 mmHg in young adults and patients with diabetes and chronic kidney disease.[3] On the contrary, the more recent JNC8 guideline defines goals of <150/90 mmHg in adults older than 60 years old and <140/90 mmHg in adults younger than 60 years of age and patients with diabetes mellitus (DM) and chronic kidney disease (CKD).[4]

Table 1 Prevalence of uncontrolled hypertension in many different countries

Authors	Year of study	Setting	Overall (n)	HT (%)	Treated (%)	Uncontrolled HT (%)
HYDRA study group[5]	2001	Germany	45,124	23,611 (52.4)	84.0	43.0
Jose Carmona et al.[6]	2003	Portugal	5,023	2,114 (42.1)	38.9	71.4
Norm Campbell MD et al.[7]	2007–2009	Canada	3,487	890 (25.5)	79.0	14.4
Zakiya Al-Busaidi et al.[8]	2010	Oman	411	411 (100.0)	1000.0	61.1
Salvador Peiro et al.[9]	2011	Spain	341,632	269,882 (79.0)	100.0	67.0
MMWR[10]	2011	USA	11,154	10,037 (90.0)	69.9	54.2

HT=hypertension

Factors associated with inadequate blood pressure control

Our study focuses primarily on patient–related factors that contribute to the burden of uncontrolled hypertension that include age, gender, access to health care, socioeconomic status, comorbidities, lifestyle and compliances.

Material and Method

Study design and participants

Data from the Songklanagarind Hospital Information System (HIS) was utilized to conduct this cross–sectional study. The setting of the study was defined as the out–patient medical care operated by the Division of Family Medicine at Songklanagarind Hospital. Using the name of the clinic, the International Classification of Diseases, 10th revision (ICD–10) billing code and the time period as sorting tools, an automated program embedded within the HIS created a list of 1,633 hospital numbers that belonged to hypertensive patients who visited the clinic from 1 October 2013 to 31 December 2013. After eliminating duplications, the patients were recruited for according to the eligibility criteria as show in Table 2.

Blood pressure measurement

Accurate measurement of blood pressure is necessary. Patients were seated quietly for at least 5 minutes prior to the measurement. Two measurements were made with the second one done a minute after the first and the average value was recorded. The records of systolic and diastolic blood pressures measured by validated electronic devices within the study period were used to determine the hypertension control status of the patient.

Data collection

The data extraction form included three main sections containing patient eligibility, patient characteristics and study variables.

The study variables consisted of general characteristics, blood pressure, comorbidities and medication profile. General characteristics included age, gender, religion, address and health care coverage. Comorbid diseases of interest included DM, dyslipidemia, obesity, cardiovascular disease, risks for future cardiovascular events, chronic kidney disease and hyperuricemia. A patient was considered to have DM if there was a

Table 2 Inclusion and exclusion criteria

Inclusion	Exclusion
1. Patients who visited the PCU* for management of hypertension from 1 Oct. to 31 Dec. 2013	1. Patients whose purpose of this PCU* visit was not for hypertension treatment
2. The diagnosis of essential hypertension was documented in two consecutive visits	2. Patients who took antihypertensive medications prescribed by non–PCU* doctors during our study period, except for cases of hypertensive urgency/emergency
3. Patients used antihypertensive drugs for the purpose of lowering BP during the study period	3. Pharmacological treatment was for less than three months
	4. Blood pressure was not documented in the latest visit within the study period

*PCU=Primary Care Unit

documented diagnosis in the medical records, the patient received hypoglycemia agents during the study period or the patient's previously measured fasting blood glucose levels of >126 mg/dL were recorded on two separate occasions.[11] Similarly, a patient was considered to have dyslipidemia if a diagnosis was documented in the patient's medical records, the patient's previously measured total cholesterol was >240 mg/dL or low density lipoproteins were >160 mg/dL12or lipid-lowering medication was prescribed to a patient during the study period. Although it isn't the best indicator of obesity reported on the emerging evidence, the body mass index (BMI) was chosen as an indicator of obesity due to an issue of information availability. In patients with a history of cardiovascular disease, all cardiovascular diseases were collected regardless of whether they were sequelae of an atherosclerotic process or not. In patients without a history of atherosclerotic cardiovascular disease, the National Cholesterol Education Programme Adult Treatment Panel III (NCEP-ATPIII) cardiovascular risk prediction scale was used to assess the patients' risk of developing cardiovascular disease in the future. Chronic kidney disease was defined as an estimated glomerular filtration rate (e-GFR) of <60 mL/min/1.73 m^2 with a corresponding creatinine level of >1.5 and >1.3 mg/dL in men and women, respectively.[3] Lastly, the patient was considered hyper-uricemia if his or her serum uric acid level was >7 mg/dL[13] or the patient used uric-acid-lowering medication during the study period. All laboratory results used in the process of defining comorbidities were retrieved from any measurement that occurred before the latest Primary Care Unit visit for hypertension or no later than 31 December 2013. However, any lab result during an acute illness or a recent medication adjustment (<3 months) was not applicable, and therefore, was not used.

Moreover, information regarding a patient's medication profile was also abstracted for evaluation. This information was composed of the numbers of antihypertensive medication classes, the amount of all drugs used and the presence of aspirin or nonsteroidal anti-inflammatory drug (NSAID) use. In terms of antihypertensive medications, the data were collected from the visit for hypertension which was the one prior to the latest visit for hypertension. Other medications, in addition to anti-hypertensive medications, were counted if those drugs were prescribed to be taken throughout the period while the patient was taking the antihypertensive medication mentioned earlier. The only exception was for NSAID use in which both short course treatment and extended use of the drugs were collected.

Study outcomes

The outcome of the study was the prevalence of patients with uncontrolled hypertension in the setting of the Primary Care Unit at Songklanagarind Hospital using the target blood pressures suggested by the Thai Guideline on the Treatment of Hypertension 2012, JNC7 guideline and JNC8. In addition, the distribution of study variables among patients whose blood pressure was considered uncontrolled and controlled was examined.

Statistical analysis

The data analysis was done by Stata IC 12 (Stata Corp, College Station, Texas, USA). Categorical data were summarized with percentages with corresponding 95% confidence interval (95 % CI). All variables were processed as dichotomous or polychotomous variables and presented as frequencies. Continuous variables were stratified into strata for the analysis. Differences of variable distribution between the groups were compared by using Pearson chi-squared test or Fisher's exact test as appropriate.

Results

Patients

Out of 1,311 patients screened for eligibility in the study, the exclusion criteria precluded 130 patients from the study mainly due to an inadequate treatment period (Figure 1).

Characteristics of patients included in this study are shown in Table 3.

Outcomes

Uncontrolled hypertension defined by the Thai Guideline on the Treatment of Hypertension

Table 4 and 5 showed that in 57.2% of the patients with uncontrolled hypertension, there were 426 patients (63.0%) who were >60 years of age. Regarding gender, religion and address, 58.7%, 96.0% and 83.9% were female, Buddhist and lived in Songkhla province, respectively. The percentages of non–smoker, ex–smoker and current smoker were 87.2%, 6.9% and 6.0%, respectively.

In terms of comorbidities, 61.8% of the patients who had poor control of their blood pressure had a BMI greater than 25.0 kg/m.[2] The percentage of patients categorized as a high risk group under the NCEP III for cardiovascular risk prediction was 77.3%. Finally, 48.1%, 83.7%, 4.3%, 5.9% and 37.6% of the patients had DM, dyslipidemia, CKD, CVD and hyperuricemia, respectively. The percentage of those who took more than 4 drugs (including non–antihypertensive ones) was 75.2%. The percentage of short–term users of NSAIDs was 9.8%. With respect to study variable distribution, variables which were disproportionately distributed between the two groups of patients were age, gender, BMI, NCEP III for cardiovascular risk prediction level, presence of DM, the total number of classes of antihypertensive drugs and the total number of drugs; these differences were statistically significant with p–values of 0.013, 0.008, 0.023, <0.001, <0.001, 0.003 and <0.001, respectively.
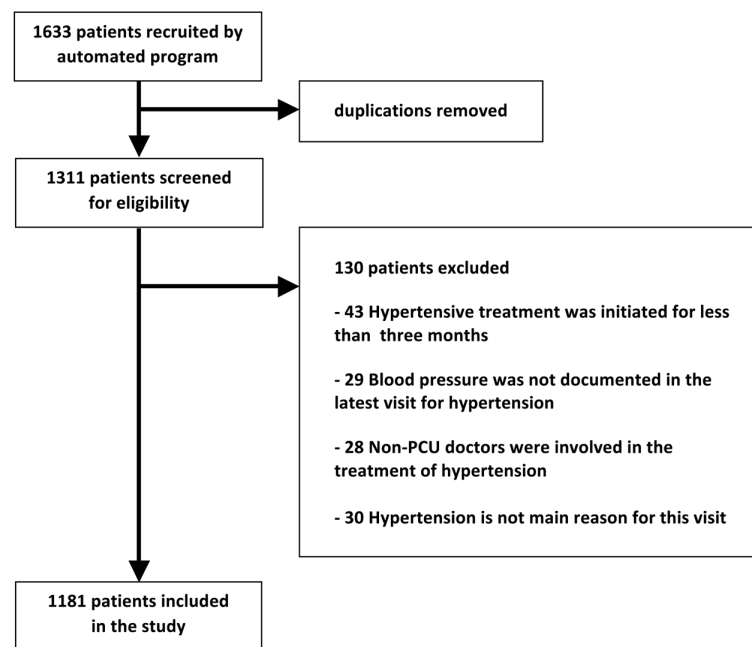

Figure 1 Patient recruitment flowchart

Table 3 Characteristics of 1,181 patients included in the study

Characteristics (total n=1,181)	Number (%)	95% CI
Age (years)		
<60	473 (40.0)	37.2–43.0
≥60	708 (60.0)	57.1–62.8
Gender		
Male	732 (62.0)	35.2–40.9
Female	449 (38.0)	59.1–64.8
Religion		
Buddhist	1,135 (96.1)	94.8–97.1
Muslim	42 (3.6)	2.6–4.8
Christian	4 (0.3)	0.1–0.9
Address		
Within Songkhla Province	998 (84.5)	82.3–86.5
Outside Songkhla Province	183 (15.5)	13.5–17.7
Healthcare coverage		
Civil servant medical benefits	686 (58.0)	55.2–60.9
Universal coverage	310 (26.3)	23.8–28.9
Pay per visit	114 (9.7)	8.0–11.5
State enterprise employee	12 (1.0)	0.5–1.8
Private insurance	13 (1.1)	0.6–1.9
Public welfare	30 (2.5)	1.7–3.6
Sub-district administrative	16 (1.4)	0.8–2.1
Organization medical benefits		
Smoking status		
Non-smoker	1,040 (88.1)	86.7–90.4
Ex-smoker	69 (5.8)	4.6–7.4
Current smoker	64 (5.4)	4.2–6.9
N/A	8 (0.7)	
Blood pressure level		
Normal	121 (10.2)	8.6–12.1
Pre-hypertension	583 (49.4)	46.5–52.3
Stage 1 hypertension	385 (32.6)	29.9–35.4
Stage 2 hypertension	92 (7.8)	6.3–9.5
Isolated systolic hypertension	287 (24.3)	21.9–26.9
Body mass index (kg/m^2) (mean=26.21)		
<23.00	191 (16.2)	20.4–26.3
23.00–24.99	157 (13.3)	16.5–22.0
≥25.00	474 (40.1)	54.2–61.0
N/A	359 (30.4)	

Table 3 (Continued)

Characteristics (total n=1,181)	Number (%)	95% CI
Comorbidities		
Diabetes mellitus	425 (22.6)	33.2–38.8
Dyslipidemia	980 (52.2)	80.7–85.1
Chronic kidney disease (N/A=32)	46 (2.5)	3.0–5.3
Hyperuricemia	426 (22.7)	33.3–38.9
History of cardiovascular disease	66 (5.6)	4.3–7.1
NCEP III for cardiovascular risk prediction		
Low	16 (1.4)	0.9–2.5
Moderate	153 (13.0)	12.5–16.8
Moderately high	258 (21.8)	22.0–27.2
High	625 (52.9)	56.4–62.4
N/A	129 (10.9)	
Medication		
Treatment started at PCU		
PCU	480 (40.6)	37.8–43.5
Others	701 (59.4)	56.5–62.2
Classes of antihypertensive medication used		
<3 classes	1,006 (85.2)	83.0–87.2
≥3 classes	175 (14.8)	12.8–17.0
All medications used (mean=4.5)		
<4 drugs	356 (30.1)	27.5–32.9
≥4 drugs	825 (69.9)	67.2–72.5
Non–ASA NSAID use		
No	1,018 (86.2)	84.1–88.1
Short course	124 (10.5)	8.8–12.4
Extended use	39 (3.3)	2.4–4.5
Aspirin use	156 (13.2)	11.3–15.3

CI=confidence interval, N/A=not available, NCEP=National Cholesterol Education Program, PCU=Primary Care Unit, ASA=acetylsalicylic acid, NSAID=nonsteroidal anti–inflammatory drug

Table 4 Prevalence of uncontrolled hypertension in the Primary Care Unit sorted by the Thai Guideline on the Treatment of Hypertension and the JNC7/JNC8 guidelines

	Thai guideline		JNC7		JNC8	
	% (n)	95% CI	% (n)	95% CI	% (n)	95% CI
Uncontrolled	57.2 (676)	54.4–60.1	53.4 (631)	50.5–56.3	30.0 (354)	27.4–32.7
Controlled	42.8 (505)	39.9–45.6	46.6 (550)	43.7–49.5	70.0 (827)	67.3–72.6
Total	**100.0 (1,181)**		**100.0 (1,181)**		**100.0 (1,181)**	

JNC7=7th Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure, JNC8=8th Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure, CI=confidence interval

Table 5 Variables found to have statistical differences on between–group analysis

Guideline used	Variables found to have statistical differences on between–group analysis	Uncontrolled		P–value
		Number (%)	95% CI	
Thai Guideline on	Age (years)			
Treatment of	<60	250 (37.0)	33.3–40.7	0.013
Hypertension 2012	>60	426 (63.0)	59.3–66.7	
	Gender			
	Male	279 (41.3)	37.5–45.1	0.008
	Female	397 (58.7)	52.2–59.9	
	BMI			
	<23.0	98 (21.0)	17.4–25.0	0.023
	23.0–24.9	80 (17.2)	13.9–20.9	
	>25.0	288 (61.8)	57.2–66.2	
	NCEP III Cardiovascular risk prediction			
	Low	4 (0.6)	0.2–1.6	<0.0001
	Moderate	35 (5.6)	3.9–7.7	
	Moderately high	103 (16.5)	1.4–2.0	
	High	484 (77.3)	7.4–8.1	
	Diabetes mellitus			
	Yes	325 (48.1)	44.3–51.9	<0.0001
	No	351 (51.9)	48.1–55.8	
	Total of class antihypertensive meds			
	<3 drugs	558 (82.5)	79.5–85.3	0.003
	>3 drugs	118 (17.5)	14.7–20.5	

Table 5 (Continued)

Guideline used	Variables found to have statistical differences on between-group analysis	Uncontrolled		P-value
		Number (%)	95% CI	
	Total number of drugs			
	<4 drugs	168 (24.8)	21.6–28.3	<0.001
	>4 drugs	508 (75.2)	71.7–78.4	
JNC7	BMI			
	<23.0	84 (19.5)	15.8–23.5	0.005
	23.0–24.9	77 (17.8)	14.3–21.8	
	>25.0	271 (62.7)	58.0–67.3	
	NCEP III Cardiovascular risk prediction			
	Low	4 (0.7)	0.2–1.8	<0.001
	Moderate	36 (6.2)	4.4–8.5	
	Moderately high	105 (18.1)	15.0–21.5	
	High	436 (75.0)	71.3–78.5	
	Diabetes mellitus			
	Yes	325 (51.5)	47.5–55.5	<0.001
	No	306 (48.5)	44.5–52.5	
	Chronic kidney disease			
	Yes	32 (5.2)	3.6–7.3	0.024
	No	580 (94.8)	92.7–96.4	
	Total of class antihypertensive meds			
	<3 drugs	512 (81.1)	77.9–84.1	<0.001
	>3 drugs	119 (18.9)	15.9–22.1	
JNC8	Age (years)			
	<60	194 (54.8)	49.5–60.1	<0.001
	>60	160 (45.2)	39.9–50.5	
	Address			
	In Songkhla	285 (80.5)	15.5–24.0	0.013
	Outside Songkhla	69 (19.5)	76.0–84.5	
	NCEP III Cardiovascular risk prediction			
	Low	4 (1.3)	0.4–3.3	0.033
	Moderate	33 (10.6)	7.4–14.5	
	Moderately high	70 (22.4)	17.9–27.5	
	High	205 (65.7)	60.2–71.0	

CI=confidence interval, BMI=body mass index, NCEP=National Cholesterol Education Program, JNC7=7th Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure, JNC8=8th Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure

Uncontrolled hypertension defined by the JNC7 guidelines

According to the JNC7 guidelines, 53.4% of the patients were allocated to the uncontrolled group. There were 388 patients (61.5%) who were ≥60 years of age. Regarding gender, religion and address, 62.0%, 95.9% and 83.5% were female, Buddhist and those who lived in Songkhla province, respectively. The percentages of non-smoker, ex-smoker and current smoker were 89.0%, 6.4% and 4.6%, respectively. In terms of comorbidities, 62.7% of the patients who had poor control of their blood pressure had a BMI more than 25.0 kg/m^2. There were 75.0% who were categorized as a high risk group under the NCEP III for cardiovascular risk prediction. Finally, 51.5%, 83.2%, 5.2%, 4.8% and 27.1% of the patients had DM, dyslipidemia, CKD, CVD and hyperuricemia, respectively. The percentage of those who took more than 4 drugs was 76.2%. The percentage of short-term users of NSAIDs was 9.8%. Among the study variables between the groups, statistically significant differences were observed in the BMI (p-value=0.005), NCEP III for cardiovascular risk prediction level (p-value<0.001), presence of DM (p-value<0.001), presence of chronic kidney disease (p=0.024) and the total number of classes of antihypertensive drugs (p-value<0.001).

Uncontrolled hypertension defined by JNC8 guidelines

Based on categorization of the JNC8 guidelines, the blood pressure of 30.0% of the patients was considered as uncontrolled. In patients with uncontrolled hypertension, 160 patients (45.2%) were >60 years of age. The percentages of non-smoker, ex-smoker and current smoker were 89.8%, 4.8% and 5.4%, respectively. In terms of comorbidities, 63.3% of the patients who had poor control of their blood pressure had a BMI more than 25.0 kg/m^2.

There were 65.7% who were categorized as a high risk group under the NCEP III for cardiovascular risk prediction. Finally, 38.1%, 84.5%, 3.9%, 4.0% and 34.2% of the patients had DM, dyslipidemia, CKD, CVD and hyperuricemia, respectively. The percentage of those who took more than 4 drugs was 70.1%. The percentage of short-term users of NSAIDS was 9.3%. After hypothesis testing, age, address and the NCEP III for cardiovascular risk prediction level were found to have statistical differences when patients with uncontrolled hypertension were compared to controlled hypertension.

Discussion

Our study demonstrated that the prevalence of uncontrolled hypertension in the setting of the Primary Care Unit was still higher than the recommended target. The Thailand Health Indicator 2014[14] recommended that >50.0% of patients should have their blood pressure under control. Our study showed that the prevalence of uncontrolled hypertension was approximately 50.0% except in the case of the JNC8 guideline in which the proportion of uncontrolled group was considerably lower than the other two guidelines. This possibly indicated that patients with comorbidities were the ones who struggled the most in controlling their blood pressure because comorbidities were the major concern which signified a lower blood pressure target in the Thai guideline and JNC7 but not in the JNC8. Assuming that medical treatment was optimized, there might be certain physiological limits on how much blood pressure can be reduced in these patients with the current treatment strategies and other socio-demographic hurdles.

Despite a number of guidelines published worldwide, there is still no settlement on which guideline is the perfect solution to the hypertensive situation.

We acknowledge several limitations in our study. The Primary Care Unit is an academically-oriented clinic. Additionally, given that almost 60.0% of the patients started their treatments somewhere else, it was presumed that many cases were referrals and less likely to be uncomplicated cases. Hence, the extension of our study results to other general primary care settings should be done carefully. This was a cross-sectional study that posed limitations on the study of determinants in uncontrolled hypertension. Notwithstanding the fact that we managed to collect a considerable amount of data regarding various factors, it's impossible to establish a firm temporal relationship between these factors and the outcomes. Besides, the role of a particular statistical interpretation, such as logistic regression, in establishing the links between predictors and outcomes in the setting of a cross-sectional study is still an on-going debate. Therefore, our study only presented associations between the variables and outcomes in forms of distributive differences, not as determinants. Lastly, because of a lack of available data and the study design, the office blood pressures used in this study were spot measure-ments which were measured by electronic devices. So, these measurements may have slightly overestimated the blood pressure. However, this study still used the office blood pressure values, because they would still be able to be compared with those from future studies.

Conclusion

The prevalence of uncontrolled hypertension in our setting remained unsatisfactory. Additionally, certain characteristics observed in patients whose blood pressure was uncontrolled might warrant further investigations in order to decipher underlying hurdles impeding successful control of hypertension.

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Appendix

Data extraction form (Collected from May 1, 2014 to May 6, 2014) uncontrolled hypertension in the Primary Care Unit of Songklanagarind Hospital: prevalence and associated factors

Instructions:

1. Mark ✓ in ☐ according to patients' information described in medical record.

2. If the required information is not recorded, mark ✓ in ☐ NA

3. The patient included in this study is a hypertensive patient who received antihypertensive treatment at the Primary Care Unit of Songklanagarind Hospital during October–December 2013, and in this study period. The patient must not receive any antihypertensive treatment elsewhere, with the only exception, being hypertensive urgency/emergency defined as:

   - Hypertensive urgency: SBP≥180, DBP≥110 with minimum to no TODs
   - Hypertensive emergency: SBP≥180, DBP≥110 with at least one TODs which includes
      o Left–sided HF
      o Papilledema
      o Retinal hemorrhage
      o Unexplained acute renal failure
      o Seizure
      o Acute aortic dissection

4. The systolic blood pressure and diastolic blood pressure are measured by electronic blood pressure measuring devices.

5. The weight and laboratory results, including total cholesterol, TG, LDL, HDL, creatinine and creatinine clearance, used in this data must be the most recent one and reported before December 31, 2013, regardless of whether it is during this study period or not.

6. Cardiovascular disease in co–morbidities section includes cardiology or nephrology specialist visit, vascular surgery visit, hospitalisation due to MI, Hx. of angina.

7. Other complications from DM, DLP and HT: hypertensive or diabetic retinopathy, hypertensive or diabetic nephropathy, peripheral neuropathy ± amputation etc.

8. Starting regimen: could only be specified in patients who are first diagnosed at PCU of Songklanagarind Hospital, if not, mark ✓ in ☐ NA

9. Other medications mean any drug, regardless of route of administration, used for the treatment of chronic diseases in which the diagnosis is properly instituted.

General information

Date form completed	__/__/__
Name of person extracting data	
Patient's hospital number	

Patient eligibility

OPD	☐ PCU	☐ others		
Follow-up date for hypertension treatment	__/__/__			
Primary problem in this visit	☐ 1° hypertension	☐ others		
Treatment has been started for 3 months	☐ Yes	☐ No		
In this study period, the patient's HT is managed only by PCU doctors.	☐ Yes	☐ No		
		Are non-PCU visits due to hypertensive urgency or emergency?	☐ Yes	☐ No
☐ Include		☐ Exclude		
Reason for exclusion:				

do not proceed if the patient excluded from this criteria

Patient characteristics

Age			☐ NA
Gender	☐ Male	☐ Female	
Religion	☐ Buddhist	☐ Christian	☐ Muslim	☐ No religion	☐ NA
Address	☐ Within Songkhla	☐ Outside Songkhla	☐ NA
Health care covered by	☐ Pay per visit	☐ Social welfare	☐ Governmental officer benefits
	☐ Universal coverage	☐ Private insurance	☐ Others (specify):……..

Study variables

Weight (kg)				☐ NA
Height (cm)				☐ NA
Waist circumference (cm)				☐ NA
Smoking	☐ Current smoker	☐ Ex–smoker	☐ Non–smoke	☐ NA
Systolic BP (mmHg)	(Date of specimen collection: __/__/__)			
Diastolic BP (mmHg)	(Date of specimen collection: __/__/__)			
Total cholesterol (mg/dL)	(Last date of specimen collection: __/__/__)			☐ NA
Triglyceride (mg/dL)	(Last date of specimen collection: __/__/__)			☐ NA
HDL (mg/dL)	(Last date of specimen collection: __/__/__)			☐ NA
LDL (mg/dL)	(Last date of specimen collection: __/__/__)			☐ NA
Creatinine (mg%)	(Last date of specimen collection: __/__/__)			☐ NA
e–GFR–EPI	(Last date of specimen collection: __/__/__)			☐ NA
e–GFR–MD	(Last date of specimen collection: __/__/__)			☐ NA

Co–morbidities/Complications			
DM	☐ Yes Duration of disease: ……….. ☐ NA	☐ No	
DLP	☐ Yes Duration of disease: ……….. ☐ NA	☐ No	
CKD (by ICD–10)	☐ Yes Duration of disease: ……….. ☐ NA	☐ No	
Cardiovascular diseases	☐ Yes (Specify)………………………….. Duration of disease: ……….. ☐ NA	☐ No	
Others	☐ Yes (Specify)………………………….. Duration of disease: ……….. ☐ NA	☐ No	
Family history of hypertension, DM, DLP and CVD	☐ Yes Specify: ……………………………..	☐ No	☐ NA

Study variables (Cont.)

Antihypertensive treatment					
Starting regimen					
☐ NA (For patients whose treatment started somewhere else rather than PCU)					
Thiazide	☐ Yes	☐ No	CCB	☐ Yes	☐ No
ACEI	☐ Yes	☐ No	ARB	☐ Yes	☐ No
Beta-blocker	☐ Yes	☐ No	LSM	☐ Yes	☐ No
Aldosterone antagonist	☐ Yes	☐ No	Combination drugs (specify)		
Others (specify)					
**Treatment rationale (if available):					
Regimen in prior visit					
Thiazide	☐ Yes	☐ No	CCB	☐ Yes	☐ No
ACEI	☐ Yes	☐ No	ARB	☐ Yes	☐ No
Beta-blocker	☐ Yes	☐ No	LSM	☐ Yes	☐ No
Aldosterone antagonist	☐ Yes	☐ No	Combination drugs (specify)		
Others (specify)					
Current regimen					
Thiazide	☐ Yes	☐ No	CCB	☐ Yes	☐ No
ACEI	☐ Yes	☐ No	ARB	☐ Yes	☐ No
Beta-blocker	☐ Yes	☐ No	LSM	☐ Yes	☐ No
Aldosterone antagonist	☐ Yes	☐ No	Combination drugs (specify)		
Others (specify)					

Other medications			
NSAIDs		☐ Yes	☐ No
Acetaminophen		☐ Yes	☐ No
Gout	Allopurinol	☐ Yes	☐ No
	Chochicine	☐ Yes	☐ No
Hypoglycaemic drug	Insulin	☐ Yes	☐ No
	Insulin secretagogues (sulfonyl ureas) Examples: glipizide, glibenclamide	☐ Yes	☐ No
	Insulin secretagogues (non–sulfonyl ureas) Example: –glinide	☐ Yes	☐ No
	Insulin secretagogues (GLP–1 inhibitor) Example: –gliptin	☐ Yes	☐ No
	Alpha–glucosidase Inhibitors (acarbose)	☐ Yes	☐ No
	Insulin sensitisers Examples: metformin, –tazone	☐ Yes	☐ No
	Others (specify)		
Lipid–lowering drugs	HMG–CoA inhibitor (statin)	☐ Yes	☐ No
	Bile acid Sequestants (cholestyramine)	☐ Yes	☐ No
	Fibrate (gemfibrozil, clofibrate)	☐ Yes	☐ No
	Niacin	☐ Yes	☐ No
	Decreases cholesterol absorption (ezetimibe)	☐ Yes	☐ No
Others (specify)			