

# Nurse-led hypertension referral system in an emergency department for asymptomatic elevated blood pressure

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<b>Objectives</b>	To determine the characteristics of asymptomatic elevated blood pressure patients in an accident and emergency setting and assess the effect of a nurse-led intervention system.
<b>Design</b>	Cross-sectional study.
<b>Setting</b>	Accident and Emergency Department of a regional hospital in Hong Kong.
<b>Participants</b>	Patients with blood pressures of 140/90 mm Hg or above recorded twice (at triage and discharge) with no previous history of hypertension. Exclusion criteria were: (1) admission to hospital; (2) known hypertension; (3) referral for hypertension; (4) blood pressure higher than 180/120 mm Hg on rechecking.
<b>Intervention</b>	Patients were issued a referral by the discharge nurse to follow-up for blood pressure monitoring in primary care.
<b>Main outcome measures</b>	Diagnosis of hypertension, follow-up rate, and risk factors of hypertension.
<b>Results</b>	Of 245 patients with asymptomatic elevated blood pressure, we were able to contact 222 for follow-up, of whom 136 (61%) claimed to have been followed up for their blood pressure, and 48 (22%) were diagnosed to have hypertension. The nurse time for finding one case was 28 minutes. The projected impact could be large. If this simple nursing guideline is implemented territory-wide, more than 7000 new cases of asymptomatic hypertension might be picked up annually.
<b>Conclusion</b>	The implementation of a simple nurse-led hypertension referral system is a cost-effective way to screen asymptomatic subjects with elevated blood pressures in the accident and emergency department.

## New knowledge added by this study

- A significant proportion of patients with asymptomatic elevated blood pressure (BP) at the accident and emergency department (A&E) will adhere to nursing advice to have their BP followed up in the primary care setting.
- Up to one-fifth of asymptomatic patients with an elevated BP at the A&E were diagnosed to have hypertension in 2 weeks.

## Implications for clinical practice or policy

- Nurses may take a more active role in recommending patients for BP follow-up.

## Key words

Blood pressure determination;  
Cardiovascular diseases; Hypertension;  
Preventive medicine; Primary health care

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## Introduction

Hypertension is a serious health problem worldwide. It is estimated to affect 1 billion individuals globally<sup>1</sup> and around 24% of the Hong Kong inhabitants aged 40 years or above.<sup>2</sup> Nonetheless, many hypertensive patients remain undiagnosed; World Health Organization statistics showed that about 50% of hypertensive subjects are unaware of their condition.<sup>3</sup> A survey conducted by The Hong Kong Primary Care Foundation showed that in the private sector, measuring blood pressure (BP) is not routine—only 24% of private practitioners routinely perform BP checking on new adult patients.<sup>2</sup> However, for all adults attending the accident and emergency department (A&E), the BP is checked routinely during triage. Apart from using the BP to triage, this piece of information is rarely made use of to screen for asymptomatic hypertension.<sup>4</sup>

The American College of Emergency Physicians issued a clinical policy in 2006

## 急症室中由護士為無症狀血壓偏高患者施行高血壓轉介計劃

**目的** 探討急症室中無症狀血壓偏高患者的特性，以及評估以護士主導的介入計劃的效果。

**設計** 橫斷面研究。

**安排** 香港一所分區醫院的急症室部門。

**參與者** 沒有高血壓病史並分別於分流及出院時量得的血壓為140/90 mm Hg或以上的病人。具以下條件的病人不被納入本研究範圍內：(1) 住院病人；(2) 已知為高血壓患者；(3) 因血壓偏高而被轉介的病人；(4) 再次量度血壓時高於180/120 mm Hg。

**介入** 急症室護士會把病人轉介至基層醫療作血壓監察跟進。

**主要結果測量** 高血壓診斷、跟進率、高血壓的風險。

**結果** 245名無症狀高血壓患者中成功聯絡222名，其中136名(61%)患者聲稱有血壓監察的跟進，另48名(22%)患者最終證實患有高血壓。找出一宗高血壓病例平均需要28分鐘的護士時間。這計劃預計影響可能很大。假如全港性施行這護士指引，每年可以找出超過7000宗高血壓的病例。

**結論** 在急症室中，這個由護士主導的轉介計劃作為篩選無症狀血壓偏高患者不但簡單，而且有效。

to address the evaluation and management of adult patients with asymptomatic elevated blood pressure (AEBP) in the A&E.<sup>5</sup> The paper concluded by recommending that “if BP measurements are persistently elevated with a systolic of greater than 140 mm Hg or diastolic of greater than 90 mm Hg, the patient should be referred for follow-up of possible hypertension and BP management.” In “Recognizing asymptomatic elevated blood pressure in ED patients: how good (bad) are we?” published in 2007,<sup>4</sup> Tilman et al found that only 7% of patients with AEBP received attention for their BP (ie diagnosis, treatment, prescription, and/or referral). In 2004, Tanabe et al<sup>6</sup> already recognised this under-identification by doctors and recommended “nurses take an active role in patient counseling and recommend blood pressure follow-up”.

The present study looks at the AEBP problem from the ‘nurse-led’ perspective. By setting up a departmental guideline on the incidental finding of AEBP, nursing staff were empowered to refer patients with even borderline high pressures to primary care for formal follow-up.

The objectives of this study were: (1) to determine the proportion of adult patients with hypertension among those having AEBP; (2) to

determine the proportion of AEBP patients that adhered to nursing advice to be followed up for their BP (Appendix A); (3) to describe factors associated with hypertension in the AEBP population; and (4) to assess the cost of the programme in terms of nursing time spent per case found.

## Methods

This was a cross-sectional study carried out from 1 to 31 July 2010. Participants were adult A&E patients (age ≥18 years) with no history of hypertension who were found to have AEBP (≥140/90 mm Hg) twice: one at triage and one before discharge. Exclusion criteria were: (1) admission to hospital; (2) known case of hypertension on regular treatment; (3) the referral initiated for hypertension; (4) very high BP (>180/120 mm Hg) on rechecking (Appendix B). For the last group, nurses alerted the medical officer for further action. We adapted the classification of BP for adults in the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (“The JNC 7th Report”) published in 2003.<sup>1</sup> That classification was based on the mean of two or more properly measured seated BP readings, on each of two or more office visits. In the A&E, the elevated BP may be related to pain, anxiety, or other reasons.<sup>7-10</sup> So we did not label the patient as hypertensive, instead we used the term ‘AEBP’<sup>4</sup> to denote this finding in a single A&E visit. We used the term ‘hypertension’ after the diagnosis was made by the primary care practitioner.

Designated nursing staff telephoned the recruits 2 weeks after their visit to determine whether they had followed the nursing advice to visit a primary care practitioner (Appendix C). During the telephone interview, the patient was considered hypertensive if he/she self-reported that a physician had diagnosed hypertension.

Our A&E has an annual census of 110 000 patients. The department set up a nursing guideline in July 2010 to empower the nurses to issue a standard referral to AEBP patients deemed not to require immediate treatment for hypertension. The study period was 1 month (July 2010).

Variables such as gender and age, smoking status, exercise status, possession of a BP device, follow-up visit, hypertension status, and treatment status were obtained during the telephone interview. Smoking status was defined by a self report as either current ‘smoker’ or ‘non-smoker’. ‘Diagnosis of hypertension’ was adapted from the JNC 7th Report,<sup>1</sup> and defined as elevated BP findings (≥140/90 mm Hg) twice at the A&E and later confirmed by a primary care practitioner. The definition of ‘regular exercise’ was also adapted from the JNC 7th Report (under “Lifestyle Modifications to Manage Hypertension”)

as exercise 3 times or more each week, of an aerobic nature, for 30 minutes or longer on each occasion.

The Statistical Package for the Social Sciences (Windows version 17.0; SPSS Inc, Chicago [IL], US) was used for data management and analysis. Patient demographic characteristics were analysed. Categorical data were in the form of counts and percentages. Univariate comparisons were made using the Pearson's Chi squared test. Independent sample *t* tests were used to compare continuous variables. A 2-sided *P* value of less than 0.05 was taken as significant, and 95% confidence intervals were calculated where appropriate.

## Results

### Telephone interview

A total of 9158 patients attended the A&E in July 2010, of whom 7627 were aged 18 years or more. Among these, 245 had AEBP (BP  $\geq 140/90$  mm Hg, twice in the A&E) and were referred for further follow-up in primary care. In all, 222 (91%) of these subjects were successfully contacted by our designated nurse after about 2 weeks (Fig). The demographic data of these 222 individuals are shown in Table 1. Their mean age was 53 (range, 18-95) years; 67 (30%) were smokers and 56% were male, 66 (30%) claimed to exercise regularly, and 68 (31%) claimed to possess a BP device at home. Lastly, 136 (61%) subjects were followed up for their AEBP, which was comparable to overseas experience.<sup>8</sup> For those followed up for their BP by a primary care practitioner, our designated nurse ascertained their hypertension status and any treatment received.

### Follow-up patients

Table 2 shows the characteristics of the follow-up patients and defaulters. It seems there was no difference in their demographic characteristics. Table 3 depicts the follow-up destinations chosen by the 136 subjects.

### Hypertension

Hypertension was diagnosed in 48/222 (22%) patients, of whom 44 (20%) were prescribed antihypertensive drugs immediately. The demographic characteristics of our hypertensive patients are shown in Table 4. So even among the AEBP group, being male, smoking, and inactivity were predictive of hypertension. Subgroup analysis for age also showed that being  $\geq 60$  years old yielded a higher percentage with hypertension than those aged  $\leq 39$  years (47% vs 19%, *P*=0.047).

### Time spent on nurse-led referral and its impact

The A&E census is around 2 million per year.<sup>11</sup>

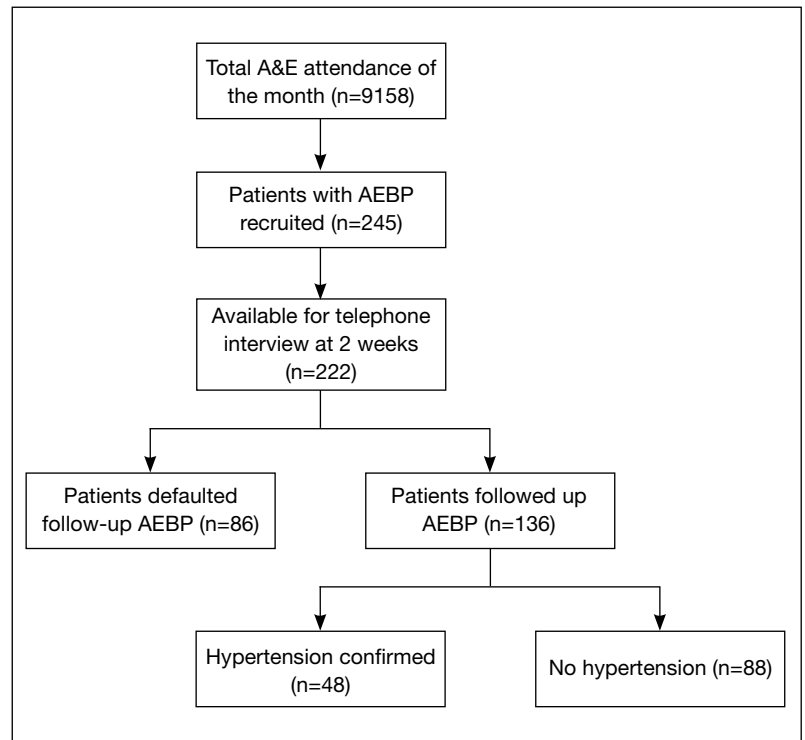


FIG. Flowchart of recruitment and follow-up

A&E denotes accident and emergency, and AEBP asymptomatic elevated blood pressure

TABLE 1. Characteristics of patients with asymptomatic elevated blood pressure

Characteristic	No. (%) of patients or mean $\pm$ standard deviation		P value
	Male	Female	
No. of patients	124 (56)	98 (44)	NA*
Age (years)	50 $\pm$ 20	56 $\pm$ 12	<0.001
Smoker	58 (47)	9 (9)	<0.001
Exercise regularly	41 (33)	25 (26)	0.221
Possession of blood pressure device	33 (27)	35 (36)	0.144
Follow-up behaviour	77 (62)	59 (60)	0.774

\* NA denotes not applicable

TABLE 2. Characteristics of asymptomatic elevated blood pressure patients who were followed up in primary care and those who defaulted

Characteristic	No. (%) of patients or mean $\pm$ standard deviation		P value
	Follow-up patients	Defaulters	
No. of patients	136 (61)	86 (39)	NA*
Male sex	77 (57)	47 (55)	0.774
Age (years)	52 $\pm$ 15	53 $\pm$ 15	0.874
Smoker	38 (28)	29 (34)	0.361
Exercise regularly	40 (29)	26 (30)	0.896
Possession of blood pressure device	48 (35)	20 (23)	0.058

\* NA denotes not applicable

TABLE 3. Follow-up destinations of asymptomatic elevated blood pressure patients\*

Destination <sup>†</sup>	Count (%)	Diagnosed hypertension (%)
GOPC	101 (74)	40 (40)
GP	34 (25)	7 (21)
China	2 (1)	0
Alternative medicine	2 (1)	0
Herbalist	1 (1)	1 (100)

\* Some subjects followed up at more than one site

<sup>†</sup> GOPC denotes general out-patient clinic, GP general practitioner, and China Mainland China doctor

TABLE 4. The characteristics of follow-up patients with and without hypertension

Characteristic	No. (%) of patients or mean $\pm$ standard deviation		P value
	Hypertension	Without hypertension	
No. of patients	48	88	NA*
Male gender	33 (69)	44 (50)	0.035
Age (years)	55 $\pm$ 12	51 $\pm$ 15	0.131
No regular exercise	41 (85)	55 (63)	0.005
Smoking	19 (40)	19 (22)	0.025

\* NA denotes not applicable

TABLE 5. Discharge data of 16 accident and emergency departments (A&amp;Es) in 2010 (from Clinical Data Analysis and Reporting System of Hospital Authority)

Patients discharged	North District Hospital, A&E (July 2010)	All 16 A&Es (2010)
All patients discharged*	6520	1 468 867
Adult patients discharged (age $\geq$ 18 years)	5285	1 191 766
Adult patients discharged (age $\geq$ 18 years): headcount <sup>†</sup>	4852	756 933

\* Including "Discharged home", "Referred for A&amp;E follow-up" and "Referred to specialist out-patient clinic/general out-patient clinic"; excluding those "Admitted own hospital", "Admitted other hospital", "Dead", "Dead after arrival", "Disappeared", "Discharged against medical advice" and "Unclassified"

<sup>†</sup> Headcount – the same patient with repeated counts of attendance is counted as 1 headcount

Ultimately 48 patients were diagnosed to be hypertensive, which is 1.0% of the target group (Table 5). This simple nurse-led intervention can lead to uncovering of more than 7000 cases per year if implemented territory-wide.

Screening for elevated BP is essentially free, given that all A&E patients have at least one triage BP taken. Simple discharge advice on follow-up and pamphlets are inexpensive. Actually we made use of existing resources without incurring any extra cost, other than for nursing time spent on rechecking the BP, delivering the hypertension pamphlet, and advising the patient to be followed up. This took up 3 minutes (at most). The 48-hour re-attendance for the AEBP group (3%) was not different from the overall rate (2.5%; Chi squared,  $P=0.53$ ).

In terms of time cost, if the 245 subjects each entailed 3 minutes of extra time spent by the nurse, this amounted to 735 minutes. In addition, from our follow-up study (May 2011), for every 100 AEBP patients identified, another 121 patients with a one-off elevated BP at triage would have their BP checked a second time and the time for such rechecking was around 2 minutes. So we estimated the overhead nurse time for this programme to be 593 minutes. With 48 new cases of hypertension found, the extra nursing time per new case identified was estimated to be 28 minutes.

## Discussion

Accident and emergency department is a busy environment where priority is given to those most vulnerable. However, non-urgent and semi-urgent cases account for 70% of our workload.<sup>12</sup> Because A&E visits are often the only medical contact some patients experience, these encounters become an invaluable opportunity to screen for hypertension, suggest lifestyle modification, and encourage follow-up care.<sup>4</sup> However in one 2006 study<sup>13</sup> of 137 patients who needed AEBP referral, only three received some attention. It has been suggested that a "screening and referral protocol could be initiated at triage" to improve the hypertension pickup rate.

Based on such considerations, in July 2010 our department set up a nurse-led intervention to initiate the AEBP referral at triage. In our protocol, any patient with an elevated BP had it rechecked at the time of discharge. The discharge nurse issued the patient three items: (1) a nurse-issued referral with the patient's BP readings and the standardised wording on the need to follow-up; (2) a hypertension lifestyle modification pamphlet published by the Department of Health; (3) an information sheet on general out-patient clinic (GOPC) booking.

There is evidence that A&E prevention programmes can save lives.<sup>14</sup> Although adding preventive services to an A&E would be cost-effective for the society,<sup>14</sup> it still represents an additional cost for the department. The present study demonstrated that hypertension screening can be implemented at a reasonably low cost by making use of readily available data from the triage record. This entailed a nurse-led intervention without the need for an A&E doctor to intervene, and utilised existing pamphlets and discharge instructions. Without falling into the trap of over-investigation, the strategy of our programme was to 'recheck and refer'. This is in line with suggestions from the nursing side<sup>6</sup> and overseas AEBP recommendations.<sup>5,7,8,13,15</sup> From our study, 245 individuals were screened to have AEBP in 1 month (or about eight cases per day), and the consequential additional workload was within the capacity of our department. The additional resources involved

should be compared to the cost of HK\$820 per A&E visit<sup>12</sup> or the HK\$0.9 billion spent by the Hospital Authority on serious diseases (stroke and heart disease) caused by hypertension between 2002 and 2003.<sup>2</sup> Given that half of the hypertensive patients are unaware of their hypertension<sup>3</sup> and hypertension is the single most important modifiable risk factor for cardiovascular disease,<sup>5</sup> it seems that this nurse-led intervention is a very cost-effective way of screening for hypertension.

Patients in A&E may experience a 'teachable moment' and there is evidence that A&E interventions targeted at high-risk groups can be very effective.<sup>16</sup> Moreover, checking the BP is not routine in the private sector,<sup>2</sup> and so the A&E may be the only potential preventive service<sup>16</sup> for a vulnerable segment of the population. Moreover, although there is no immediate benefit to the A&E, unmet preventive health needs result in A&E visits for more serious problems in the future.<sup>16</sup> There are also reasons not to institute preventive services in A&E, namely: lack of time and staff; long waiting times; overcrowding; and the need to treat the most vulnerable patients first.<sup>16</sup> Coordinating follow-up for screening may be impractical. We do not want to detract from our primary mission to provide quality emergency services. However, balancing the pros and cons, perhaps the appropriate question should be 'What prevention should we undertake?' rather than 'Should we undertake prevention?' In this context, this paper has shown that a simple nurse-led intervention can effectively pick up hypertension and have an impact on our health care system.

## Limitations

The study was carried out over 1 month in one centre, whereas a longer study period and/or more centres should be involved to validate the message. Possible variations across geographical areas due to differences in age, socio-economic class, and prevalence of smokers could all affect the frequency of AEBP. At the time of the study, only the 'current

smoking' status was asked about, which could have resulted in misclassification of smoking status, as the status of ex-smokers remains unclear. The diagnosis of hypertension was made by different doctors and hence was not standardised. The 2-week follow-up period may be too short to pick up delayed actions. The proportion that complied with follow-up (60%) was moderate. Hence, self-selection bias was possible. Those who opted to attend for follow-up were more likely to be health-conscious, so there is possible bias in underestimating the actual number of hypertensive patients. The extra nursing time calculation of the nurse-led intervention was simplified. The overheads of the programme (planning, briefing, promotion, execution, and auditing) were not taken into consideration. The estimate of 7000 new cases of asymptomatic hypertension was based on the Clinical Data Analysis and Reporting System data. The actual number could be smaller, as the estimate was based on the headcount of adult patients discharged, without excluding those with pre-existing hypertension.

## Conclusion

A nurse-led intervention to screen hypertension was put into effect in July 2010. About 60% of the AEBP group was followed up for their BP, and finally about one fifth of the subjects were diagnosed to have hypertension. Within the AEBP group, male gender, smoking, lack of exercise, and old age were risk factors for hypertension. Three quarters of those counselled chose the GPC and one quarter chose general practitioners for their first primary care follow-up. The impact of this simple programme could be large, if carried out territory-wide.

## Appendices

Additional material related to this article can be found on the HKMJ website. Please go to <<http://www.hkmj.org>>, search for the appropriate article, and click on Full Article in PDF following the title.

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## Appendix A– Nurse-led hypertension advice

North District Hospital  
A&E Department

北區醫院  
急症科

Patient's name  
Sex/Age  
Date

Patient gum label

### Advice on Elevated Blood Pressure 血壓偏高忠告

First reading 第一次血壓

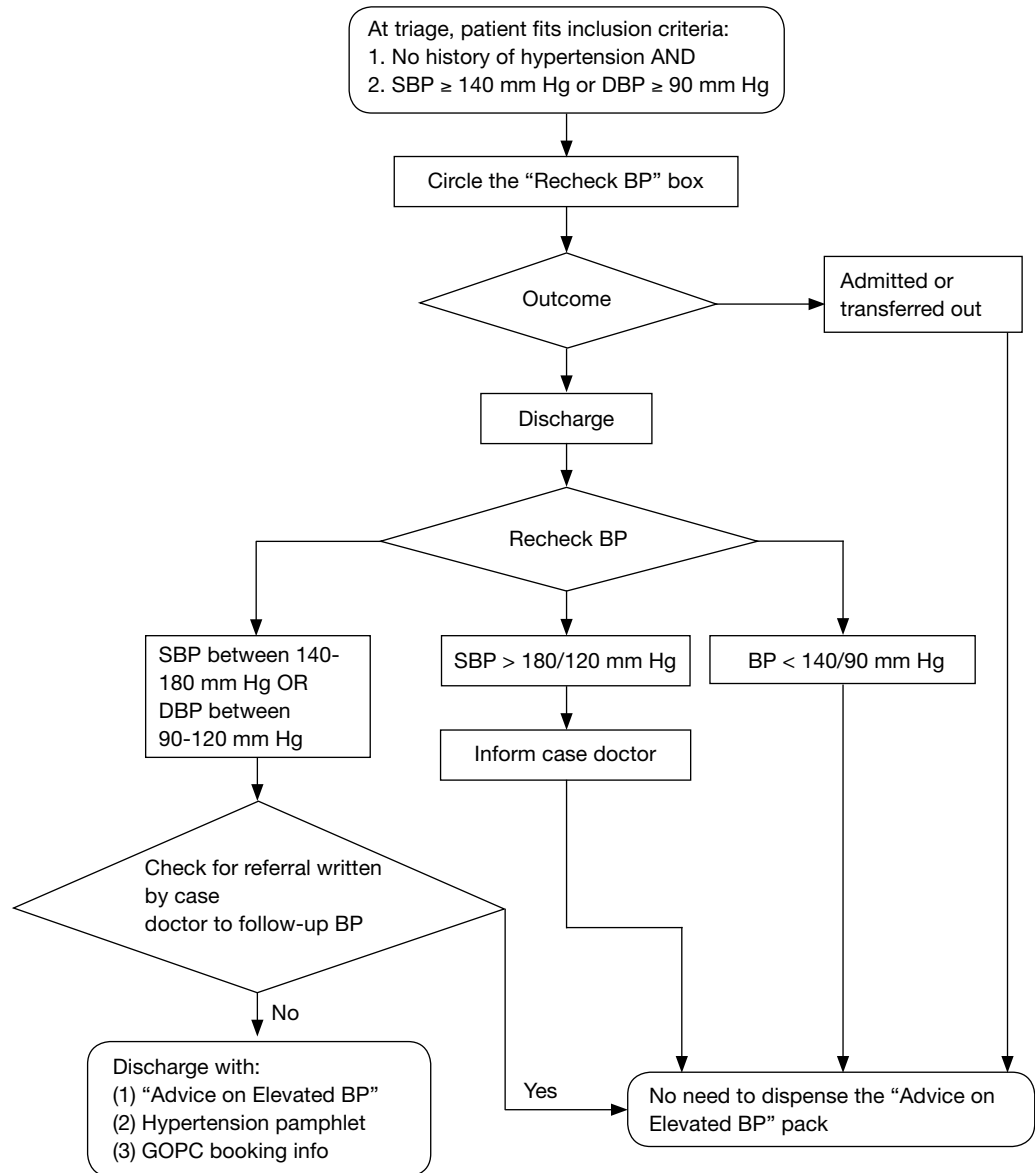
BP: \_\_\_\_\_ / \_\_\_\_\_ mm Hg; P: \_\_\_\_\_ /min (分鐘)

Discharge reading 離開時血壓

BP: \_\_\_\_\_ / \_\_\_\_\_ mm Hg; P: \_\_\_\_\_ /min (分鐘)

This does **not** mean you have hypertension. Please visit your **family doctor** or a **clinic** in 7 days to follow-up your blood pressure.  
這並不代表你患有高血壓；請於七日內到私家醫生或門診部覆驗血壓。

# Appendix B. Flow chart of nurse-led hypertension referral





### Appendix C. Questionnaire of the telephone interview (conducted in Cantonese)

1. 你有否跟進這情況？	有
	沒有
2. 如有，在那裡？	私家醫生
	政府醫院/門診
	中醫
	自己買藥
	返大陸醫
	另類療法
	其他
3. 醫生有否診斷您患上高血壓？	有
	沒有
	未確定
4. 你是否需要服降血壓藥（西藥）？	要
	不需要
5. 家裡有否添置血壓計？	有
	沒有
6. 如沒有，有否定期自我量度？	有
	沒有
7. 你是否吸煙者？	是
	否
8. 有否每星期做最少三次，每次做最少三十分鐘的帶氧運動？	有
	否