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A Review of Self-Monitoring of Blood Pressure for Self-Management of Hypertension

Park, Young-Im[1] · Susanna L.Cunningham[2]

INTRODUCTION

Hypertension is one of the most important chronic health problems which confronts health providers and it is also one of the most preventable causes of stroke and other cardiovascular complication(Cappuccio, Kerry, Forbes, & Donald, 2004). Most chronic diseases including cardiovascular disease & hypertension benefit from patient self-management strategies. Blood pressure (BP) control is the very important target behavior, and thus health providers should consider the effective strategies to improve the self-management behavior of hypertensive patients.

Despite major financial and time investments, treatment compliance of hypertension has remained low and majority of patients do not reach their current target BP levels(Halme, Vesalainen, Kaaja, & Kantola, 2005). Most patients with treated yet uncontrolled hypertension have usually been seen by their health care providers several times per year (Canzanello, Jensen, Schwartz, Worra, & Klein, 2005), and thus effective self-management interventions are needed.

Siegrist(1995) suggested successful self-regulation has powerful health-promoting potential and successful self-management of hypertension would include the interpersonal and the structural level of intervention.

According to social cognitive theory, human behavior is self-regulated through internal standards and self-evaluative reaction to their own behavior(Bandura, 1986). Bandura postulated that self-regulation consisted of self-observation (self-monitoring), judgmental process, and self-reaction. Self-monitoring provides the information necessary for setting realistic performance standards and for evaluating ongoing changes in behavior(Bandura, 1986). Thus, self-measurement of blood pressure provides information about performance dimensions to control the hypertension and is a basic activity in self-regulation of hypertensive patient's behavior.

Self-monitoring of blood pressure is recommended as a promising method to improve blood pressure control. This technique has many advantages including evaluation of target organ damage, identification of the white-coat hypertension, and improvement of pharmacologic compliance(Canzanello et al., 2005; Cappuccio et al., 2004; Jain & Krakoff, 2002; Verberk, Kroon, Kessels, & de Leeuw, 2005).

The interest in home blood pressure monitoring has grown with the widespread availability of devices, greater patient involvement in self care, recognition of the limitations of office blood pressure monitoring, and the expense and inconvenience of ambulatory blood pressure monitoring (Pickering et al., 2005; Wilson & Johnson, 1997). Therefore, home BP monitoring by patients could be considered as a useful practice to involve patients more closely in the management of their own blood pressure and help to manage their hypertension more effectively(Cappuccio et al., 2004).

Key words : Self-monitoring, Hypertension, Literature review
1) Professor, Department of Nursing, Daejeon University(Corresponding author, E-mail: park54@dju.ac.kr)
2) Professor, Biobehavioral Nursing and Health Systems, School of Nursing, University of Washington

Although the self-management program for chronic disease has been increasing in popularity, there is no agreement on what constitutes the essential elements of self-management program(Chodosh et al., 2005). There also have been suggested some problems of home blood pressure measurement such as: method of measurement, normal value, and predictive extent of prognosis(Stergiou, Thomopoulou, Skeva, & Mountokalakis, 2000; Thijs et al., 1998; Verberk et al., 2005).

Nowadays health providers in nursing have responsibility to promote self-care behavior of clients and to provide comprehensive services through effective nursing interventions.

The purpose of this review is to identify the characteristics, benefits, and limitation of self-monitoring in patients with hypertension in order to assist clinicians to develop the effective self- management strategies for hypertensive patients.

METHODS

A two step process was used to search the literature. First systemic review was done to identify the self-management methods for patients with hypertension. Two key words were used to search in the PubMed database(1996 to 2005): hypertension and self-management.

The PubMed is one of the useful databases, but this study has limitation using only one database. And this review was done to find out the articles published in other countries, therefore, Korean articles were not included for this study.

Sixty nine journal articles related to self-management of patients with hypertension were selected. Simple drug-effect studies or studies without patient involvement were excluded in this review. There were several methods of self-management for patients with hypertension such as: home monitoring or self-monitoring(37 articles), general self-management or program (10 articles), education/counseling(8 articles), medication improvement(5 articles), telemonitoring & communication(3 articles), exercise & life-pattern modification(2 articles), and other(4 articles). Self-monitoring was selected as the most interesting subject for this review.

The second search of the literature was done using the additional key terms of blood pressure and self-monitoring with the result that 8 additional relevant articles were identified. Therefore 45 articles were reviewed for this study.

RESULTS

This review was described according to effect of self-monitoring, diagnostic value & classification, accuracy of measurement, and other issues for management. For the more specific information, a summary of studies about effects and diagnostic value of self-monitoring was shown in <Table 1>.

Studies reviewed used many different terms related to self-monitoring for hypertension such as: home blood pressure measurement(HBPM), home measurement, home BP self-measurement, self-monitoring, home monitoring, and self-blood pressure monitoring.

One study about terminology compared self-home measurement to demonstrate the most appropriate term. There was no difference between self-measured blood pressure and physician –measured blood pressure in clinic, or between self and relatives measured blood pressure at home(R-HBP). Self-measured blood pressure in clinic(S-CBP) was higher than self-measured BP at home(S-HBP) and relatives-measured BP in clinic. Physician-measured BP in clinic was also higher than S-HBP and R-HBP. According to this result, self-measurements were different between home and clinic setting and they recommended "home blood pressure measurement" represents a more appropriate term(Stergiou et al., 2003).

Effect on blood control

The most significant effect of self-monitoring is an improvement in blood pressure control. Recently some studies were found on the influence of self-monitoring on BP control, patient compliance and treatment.

A randomized trial to test whether a patient-directed management strategy for chronic stable essential hypertension based on the use of home blood pressure monitoring devices could improve blood pressure control. The mean arterial blood pressure of 31 subjects was more decreased in the patient-directed management used in the home blood pressure monitoring than that of the office-based management(-0.95 /+1.90mm Hg, p= .039)(Zarnke, Feagan, Mahon, & Feldman, 1997).

Intensified intermittent home BP measurement also was associated with decrease in systolic and pulse pressures significantly than the control group received conventional care in primary care center(Halme et al., 2005). Two hundred and

<Table 1> Summary of studies about effects and diagnostic value of self-monitoring

First Author	Year	Topics	Methods	Results	Comments
Canzanello,VJ	2005	BP control effect	Comparison of 1 year f-u completed group(78person)	*Baseline 154+-15/84+-11mmHg → 1year 131+-9/75+-7mmHg *135/85mmHg less: 0%-> 63% *Antihypertensive medication changed 1.2-> 2.0	1week BP record (1,3,6,9,12 m) *Medication tx data
Halme, L	2005	BP control effect	Exp(s-m) group/control (113/119person)	*Systolic; -7.8/-4.5mmHg(p=.047) *Pulse p; -4.7/-2.2mmHg(p=.042) *Diastolic; -3.1/-2.3mmHg(p=NS)	1week self-monitoring (2,4,6m)
McManus, RJ	2005	BP control & Cost effect	RCT (441 person)	*6 month systolic; mean 4.3mmHg reduced (p=.004) *6month diastolic; mean -0.4mmHg(p=NS)	1 year systolic & diastolic: NS
Cappuccio, FP	2004	Home monitoring effect	Meta-analysis	*Overall effect: 4.2/2.4mmHg(p<.001/.014) *Revised effect: 2.2/1.9mmHg	Randomized controlled 18 trials
Hond, ED	2003	Diagnosis	Comparison (247 patients)	*CBP: 155.4/100.0mmHg *HBP: 143.1/91.5mmHg *ABP: 148.1/95.0mmHg *White-coat effect: 5.0/3.5mmHg	Untreated patients Specificity of HBP: 88.6%
Listerri, JL	2003	Validity value	Observational, cross-sectional study(124 patients)	*Sensitivity: 97.3%(95% CI 90.4-99.7%) *Specificity: 62.7%(48.1-75.9%)	Poor controlled hypertensive patients
Jain, A	2002	Diagnosis	Comparison (50 person)	*Reclassification: 46%(same), 40%(down) 14%(up)	Omron IC device JNC VI guideline
Stergiou, GS	2000	HBP normalcy	Cross-sectional study (562 person)	*HBP: 120.0±17.8/72.6±8.8mmHg *CBP: 118.7±17.7/73.8±10.5mmHg *HBP normalcy: less 137/82mmHg	Omron HEM 705CP
Jula, A	1999	Clinical evaluation	Comparison (239 patients)	*Clinic Bp: 144.5±12.6/94.5±7.4mmHg *Home BP: 138.9±13.1/92.9±8.6mmHg *24h ABPM: 141.7±14.0/87.2±7.6mmHg	Middle-aged untreated hypertensives
Mengden, T	1998	Reference value	Comparison (25 patients)	*Home & ambulatory pressure(day): 141.2/83.9mmHg *Clinic pressure: 169.2/95.0mmHg *Cutoff value: above 135/85mmHg	Patients with hypertensive heart disease
Thijs, L	1998	Reference value	Meta-analysis	*Cutoff of hypertension: above 135/85mmHg	17 studies analyzed

Notes: BP= blood pressure, CBP=clinical blood pressure, HBP=home blood pressure, ABP=ambulatory blood pressure, f-u=follow up

sixty nine hypertensive patients participated in this randomized, parallel-group study and participating physicians were instructed to intensify the antihypertensive therapy when needed. The self-monitoring group and the control group had similar home BP levels at the beginning. Systolic BP(-7.8/-4.5mmHg, p=.047) and pulse pressure(-4.7/-2.2mmHg, p=.042) decreased significantly more in the self-monitoring group. In addition, the result showed self-monitoring group reached home BP target more than those in the control group(29% vs. 16%, p=.016). On the other hand, systolic pressure of 400 patients had significantly reduced after six months(mean difference 4.3mmHg) but not after one year(mean difference 2.7mmHg). Patients in the intervention group of this randomized controlled trial received treatment targets along with facilities to measure their own blood pressure and were asked to visit their general practitioner if their blood pressure was repeatedly above the target level. But, overall diastolic pressure were not changed in targeted self-monitoring group(McManus et al., 2005). And there was a reviewed result that self-monitoring was associated with moderate net reductions in diastolic blood pressure (weighted mean difference: -2.0mmHg)(Fahey, Schroeder, & Ebrahim, 2005).

Canzanello et al.(2005) performed the study to assess whether a physician-nurse team model could improved long-term hypertension control rates by active intervention based on home blood pressure measurement. They reported that mean BP of home monitoring 78 patients who did complete the study decreased from baseline(154±15/84±11mmHg) to 131±

9/75±7mmHg at 12 months significantly. The percentage of patients who achieved BP control to less than 135/85mmHg increased from 0% to 63%. This study suggested that the use of home BP measurement has the potential to significantly improve long-term hypertension control.

And Cappuccio et al.(2004) also tried to determine the effect of home blood pressure monitoring on blood pressure levels. They indicated an overall home monitoring effect of 4.2/2.4 mmHg and 2.2/1.9mmHg after allowing for publication bias by their meta-analysis based on 18 randomized trials. They found BP control and greater proportion achieving targets were increased in home monitoring people than standard blood pressure monitoring.

Thus, home BP monitoring contributed to improve long-term hypertension control by health provider in geographically dispersed patients. These studies suggested home monitoring model could be contributed to an important reduction in vascular complications among the hypertensive population.

Diagnostic value

Many researchers have raised questions about the limitation by the lack of generally accepted reference values for self-recorded blood pressure and have tried to identify the level of home pressure that best corresponds to a clinic pressure of 140/90mmHg. The Seventh Report of Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure(JNC 7) recently has defined the hypertension beginning at 140/90mmHg and normal blood pressure as <120 and <80mmHg and 120 to 139 and 80 to 89 mmHg are classified as prehypertension(Pickering et al., 2005).

Thijs et al.(1998) reviewed the reference values for self-recorded blood pressure in their meta-analysis. According to the meta-analysis of summary data from 17 studies, they suggested a mean self-recorded blood pressure above 130/85 mm Hg may be considered hypertensive and these values were also similar to the thresholds proposed for the daytime ambulatory blood pressure(Thijs et al., 1998).

Risks of cardiovascular disease may be increased at lower blood pressure limits than those suggested by the World Health Organization(WHO). Mengden, Schwartzkopff, and Strauer(1998) compared casual, self-measured, and ambulatory 24-hour blood pressure values in 25 hypertensive patients with proven hypertensive small-vessel disease. There was no significant difference between home and ambulatory readings and both home and ambulatory daytime readings(141.2± 11.8/83.9±10.2mmHg) were significantly lower than the clinic readings(169.2±16.5/95.0±11.6mmHg). They reported that definition of hypertension by WHO might be set too high when blood pressures were measured by patient at home. In conclusion, they suggested a cutoff value of above 135/85 mm Hg, as in ABPM, may be a more realistic upper limit for self-monitoring with proven hypertensive heart disease(Mengden, Schwartzkopff, & Strauer, 1998).

A review study also suggested the upper limits of normotension in adult include 135/85mmHg for the self-measured BP on the basis of a meta-analysis of published articles(Staessen & Thijs, 2000). They concluded this reference value for the self-measured blood pressure might be further validated by prospective evidence, but could guide to refine the diagnosis and the management of hypertension based solely on conventional sphygmomanometer.

There were different values in other studies recently. Stergiou et al.(2000) evaluated reference value of home blood pressure by cross-sectional study. The threshold of HBP normality was analyzed from 562 subjects using three different approaches(distribution criterion, correspondence criterion, and the regression criterion). The findings of the three criteria suggested that average HBP less 137/82mmHg might be considered as normal and over 140/86mmHg as abnormal.

Imai et al.(2004) reviewed the reference value of home blood pressure for treatment goal. The normotensive value of 125/85mmHg was approximately equivalent to a clinic blood pressure level of 140/90mmHg. They proposed that a value of less than 125/80mmHg would be the goal for home BP (Imai, Ohkubo, Kikuya, & Hashimoto, 2004). In addition, according to Divison and colleagues(2004), self-measured BP values were lower than values currently accepted(135/85mmHg) for defining hypertension. They performed descriptive study to establish reference values for self-measurement blood pressure from 989 subjects. Using linear regression, the self-measured BP at home hypertension threshold would be 131/82mmHg and the limit of normality 123/78mmHg. When they used corresponding percentiles, they evaluated these values would be 134/85 and 124/80mmHg (Divison et al., 2004).

The reference value of blood pressure is very important to diagnosis and treatment of hypertension. Although the reference value is not coincident, the committee of American Society of

Hypertension, reviewing several studies, recommended 135/85 mm Hg as the upper limit of normal for home and ambulatory blood pressure(Pickering et al., 2005).

Detective effect for white coat hypertension

As clinic blood pressure was higher than self-measured or ambulatory blood pressures caused by white-coat effect, classification of hypertension by casual measurement may lead to overdiagnosis and overtreatment(Jula, Puukka, & Karanko, 1999).

Some studies supported that self-monitoring of blood pressure is useful for diagnosis and treatment of hypertension in contrast with a clinic or ambulatory blood pressure(Aylett, Marples, & Jones, 1999; Comas et al., 1998; Stergiou, Zourbaki, Skeva, & Mountokalakis, 1998; Wilson & Johnson, 1997), but there was a report about the inverse white coat response in self-monitoring group(Turnbull, Magennis, & Turnbull, 2003).

Staessen and Thijs(2000) reviewed that automated BP measurement is most useful to identify patients with white coat hypertension and ambulatory BP monitoring is also better than conventional BP measurement to assess the effects of treatment. Recorded home blood pressure measurement provides an accurate, reliable and unbiased assessment(Jain & Krakoff, 2002). They recommended that home blood pressure measurement is a highly useful method for assigning the appropriate blood pressure classification and the reclassification can be helpful for those who rely on current guideline for risk assessment(Jain & Krakoff, 2002).

Listerri and Collegues(2003) also suggested that home monitoring of blood pressure is a useful alternative to ABPM to rule out office-based poor control of hypertensive patients by observational and cross-sectional study. They reported the sensitivity of home monitoring was 97.3%(95% CI 90.4-99.7%) and specificity was 62.7%(48.1-75.9) of home monitoring (Llisterri et al., 2003).

A recent study also supported that home BP measurement is sometimes recommended as an alternative to ambulatory BP monitoring to diagnose white-coat hypertension(Celis, Den Hond, & Staessen, 2005) and home blood pressure monitoring appear to be appropriate methods for the detection of masked hypertension(Stergiou, Salgami, Tzamouranis, & Roussias, 2005). On the other hand, there was a reviewed result that home monitoring has a role in the detection of blood pressure, but not at the expense of careful blood pressure measurement in the office(Manning & Donnelly, 2005).

Accuracy of measurement

With respect to the appropriate management of hypertension, self-measurement of blood pressure should be measured by the accurate and validated measuring devices as an important prerequisite(Celis et al., 2005) and requires special education for appropriate measuring.

Merrick et al.(1997) conducted a study to assess the accuracy of monitoring devices and found that 34% of patients obtained inaccurate readings with the difference of 10 mm Hg or less. The significant number of inaccurate readings showed that supervision of their use needs to be incorporated into the physician follow-up(Merrick, Olive, Hamdy, Landy, & Cancellaro, 1997).

However, the other study showed the accuracy and reliability of patient initiated blood pressure measurement and recording in pregnant women with preeclampsia(Waugh et al., 2003). According to their result, the inaccurate reading was restricted to one woman. They concluded that accurate blood pressure recordings allowed to the earlier detection of preeclampsia without the inconvenience of additional visits to hospital.

To improve the accuracy of self-monitoring, the monitoring pattern and method would be considered. Port, Palm, and Viigimaa (2005) found that the self-monitoring regimen had two phases of usage. First stage was the initial enthusiasm period (the first one to two months) and followed by a phase of lower usage(89% versus 64%, $P<0.01$). Monitoring was missed more often during weekends than workdays(7.3 vs 5.0, $P<0.01$). The remote BP monitoring was capable of collecting consistent and accurate data, with sufficient sensitivity to reveal trends(Port, Palm, & Viigimaa, 2005).

Pickering and colleagues(2005) recommended measurement of blood pressure from the arm has always been the standard method, although the use of the more distal sites may be more convenient such as fingers. They evaluated only a few of automatic electronic devices have been subjected to proper validation test and it is recommended to use the validated monitors(Pickering et al., 2005). Other recommendations were that the cuff size is adequate for patients and patient should not do any activity such as exercise of eating and should be resting quietly for 3 to 5 minutes before measurement. Three

readings should be taken in succession, separated by at least 1 minute and the average should be used. It is helpful to get readings in the early morning and the evening(Pickering et al., 2005).

More than half the subjects omitted and fabricated readings, and thus devices that have memory or printouts of the readings have the potential of overcoming these barriers. Readings taken with a tele-monitoring system may improve patient compliance and blood pressure control and correlate more closely than clinic readings with ambulatory blood pressure(Pickering et al., 2005).

Other issues related to self-management

When the self-monitoring of blood pressure have an effect on blood pressure control, validated reference value for hypertension and measurement would be adequate with standard method, more advantages are expected from the use of self-monitoring in popularity.

If the clinical significance of home BP measurement is obvious, patients can recognize the effects of antihypertensive treatment(Imai et al., 2004), reduce the number of clinic visits, the number of switches of medication and antihypertensives prescribed(Wilson & Johnson, 1997).

Padfield(2002) suggested some evidence that careful use of self-monitoring may improve blood pressure control in patients who are otherwise resistant to care and Imai, Okubo, Kikuya, and Hashimoto(2004) also concluded home BP measurements may improve the treatment and encourage drug compliance and have a beneficial effect on the economics of diagnosis and treating hypertension. Pickering et al.(2002) reviewed SBPM had the potential to reduce the number of clinic visits and also to improve blood pressure control.

However, there were another results that physician visit was more increased than office-based management(1.05 v 0.2 visits /8 weeks, p= .045). As patient-directed management strategy using home blood pressure monitoring was assigned to adjust drug therapy by protocols, physician visits might be increased in short term. But, compliance rates(24h sodium excretion, weight, alcohol intake, doses missed) and quality of life scores were not significantly different in using the patient-directed management strategy with home blood pressure monitoring (Zarnke et al., 1997).

On the other hand, the systolic pressure and 24-hour ambulatory monitor systolic pressures remained significantly decreased in self-measurement patients, but SM patients were less likely to have their medications increased and more likely to have them reduced or ceased(Bailey, Carney, Gillies, & Smith, 1999).

Knowledge of patients of hypertension is one of influencing factors in improving the health behavior. It was supported that self-measurement of blood pressure could implicate to ameliorate the education in hypertensive patients in treatment (Hanon et al., 2001). The subjects possessed a self measurement device had a better knowledge of their usual blood pressure level(93% vs 77%, $p<0.01$), of their antihypertensive treatment (83% vs. 70%, $p<0.05$), and of the normal blood pressure values than subjects without self measurement device(56% vs. 33%, $p<0.01$)(Hanon et al., 2001). These results indicated that the possession of a self-measurement device contributed to the education of hypertensive patients.

Several studies suggested the self-monitoring has the prognostic significance for hypertension.

There was a consensus on the automated blood pressure measurement that the self-measurement of blood pressure is equally as effective as ambulatory blood pressure monitoring in identifying the white-coat effect(Staessen et al., 2001). Hond et al.(2003) also examined self-measurement of blood pressure at home can be an alternative to ambulatory monitoring to diagnosis white-coat hypertension. The white-coat effect was 5.0/3.5mmHg and specificity of HBP to detect white-coat hypertension was 86.6%, and sensitivity was 68.4%. They recommended HBP for screening while ABP has a better prognostic accuracy(Hond et al., 2003).

Despite lack of prognostic data, Pickering et al.(2005) have reviewed that home blood pressure predicts morbid events better than conventional clinic measurements and an increasing body of evidence that home blood pressure may also predict target organ damage.

DISCUSSION

Nurses can play an important role in promoting the self-care in patients with hypertension and in guiding them by comprehensive self-management intervention.

As self-monitoring is a basic activity included in self-management of patients with hypertension, nursing providers should understand the benefits and limits of

self-monitoring and instruct the patients to follow the accurate measurement of blood pressure for their health promotion.

To identify the characteristics of self-monitoring comprehensively, this review was conducted using 69 journal articles searched in PubMed database.

In terminology, many different terms are used to imply the self-monitoring activity. Stergiou et al.(2003) only recommended "home blood pressure measurement" represents a more appropriate term. They found that blood pressure measured at home was higher than that measured in clinic by patients. However, self-measurement in clinic is very rare situation and it usually represents measurement taken at home. Also 'self' is important factor in nursing management of chronic patients, the term of 'self-monitoring of blood pressure' is used mainly in this study. Furthermore, self-monitoring can include the measurement by family or relatives as a broad meaning based on the result that self-home measurement and measurement taken by relatives were not different(Stergiou et al., 2003).

Diagnostic reference value and accuracy of measurement are very critical consideration to instruct the hypertensive patients. The reference values suggested by some studies were not same according to their subjects and cutoff method(Divison et al., 2004; Stergiou et al., 2000; Thijs et al., 1998). The committee of American Society of Hypertension recommended 135/85 mmHg as the upper limit of normal for home and ambulatory blood pressure that best corresponds to a normal clinic pressure of 140/90mmHg(Pickering et al., 2005). Therefore, this may be generally accepted reference values of hypertension to identify the level of home pressure.

Although blood pressure monitoring devices have become available to measure blood pressure at home, it is important to monitor adequacy of blood pressure control(Merrick et al., 1997; Padfield, 2002). 50% of subjects with self-measurement blood pressure device bought these devices without medical advice and self-measurements of blood pressure were made at the wrist in 20% of subject(Hanon et al., 2001). Thus, some guideline for the accurate measurement including validated device, measuring method, cuff size, and position of patient (Pickering et al., 2005; Port et al., 2005) should be considered by nursing providers.

In addition to improve the accurate self-monitoring, the quality of training of patients in their use was required (Padfield, 2002) and supervision of their use needed by the health providers(Merrick et al., 1997). As a supportive result for education, higher educated and younger patients wanted to participate and tended to self-monitor and training increased preference for the idea of SBPM, prospective monitor ownership and self-monitoring intention(Tyson & McElduff, 2003). These results showed that appropriate education or training for self-monitoring before measurement should be provided.

Some patients often drop out from a regimen due to lack of perceived effect and more than half of those patients failing to achieve target BP display poor compliance(Port et al., 2005). Especially, there were more withdrawer from the self-monitoring group in men(Halme et al., 2005) and increasing omission of measurement was during weekend (Port et al., 2005). However, blood pressure recordings taken and documented by young women with preeclampsia were very accurate(Waugh et al., 2003). Therefore, self-monitoring requires motivation and input from the health providers to overcome these barriers of gender, age, and time.

The electronic monitors with memory and systems for sending stored readings over the telephone to the health care provider have the potential of overcoming these problems and anticipated that hypertension will be managed by the 'virtual hypertension clinic' between the patient and the health-care provider for maintenance and follow-up(Pickering, 2002).

It is evident that treatment and prognosis of the hypertensive patients can be improved by complementing the clinic blood pressure measurements in the health care setting(Comas et al., 1998). Many studies have evaluated significances for hypertension management that home-monitoring or self-monitoring has numerous advantages over ambulatory monitoring, effect control of blood pressure, identifying white-coat hypertension and misdiagnosis, and a convenient measuring over long time (Aylett et al., 1999; Comas et al., 1998; Hond et al., 2003; Pickering et al., 2005; Staessen et al., 2001; Staessen & Thijs, 2000; Thijs et al., 1998; Wilson & Johnson, 1997). However Celis et al.(2005) evaluated home BP measurement cannot replace ambulatory BP monitoring in the diagnosis of hypertension and both techniques have complementary roles.

With respect to another significant effect, Imai, Okubo, Kikuya, and Hashimoto(2004) suggest that home BP measurements encourage medication compliance, follow-up clinic visits, and active participation in the medical treatment, thus resulting in improved management of hypertension. From these findings, self-monitoring of blood pressure may improve medication compliance, thus decreasing blood pressure

resulted. When patients could adjust drug therapy by protocols and the participating physicians were instructed to intensify the antihypertensive therapy based on home blood pressure, these effects were more evident(Halme et al., 2005; Zarnke et al., 1997).

However, there were some results that self-monitoring alone was not effective to improve hypertension. Zarnke and colleagues(1997) explained simple home blood pressure monitoring couldn't change the comprehensive behaviors of patient. Boulware et al.(2001) also suggested that counseling offered BP improvement and that adding structured training courses to counseling may further improve BP through a review study. There was not enough evidence to conclude whether self-monitoring of BP alone offer consistent improvement in BP over counseling or usual care(Boulware et al., 2001) and education alone does not appear to be associated with large net reduction in blood pressure(Fahey et al., 2005). Therefore, when self-monitoring will be accompanied with other management strategies, health outcome will be more improved and effective.

In summary, the general results from this review suggested that current evidences in self-monitoring of blood pressure by patients with hypertension could be used to improve those patients' treatment and prognosis as a self-management in community health care setting. For the future research, literature review of the self-regulation study for hypertensives in Korea would be needed to compare with this study.

CONCLUSIONS

The findings of this review support that self-monitoring of blood pressure is useful in the control of hypertension. The self-monitoring of blood pressure can be regarded as a valuable activity for the assessment, prognosis of treated patients, improvement of antihypertensive medication and educational attitude in patients with hypertension.

The diagnostic reference value for self-monitoring can be recommended for the assessment and evaluation of hypertension in community nursing setting.

For the accurate blood pressure data, the self-monitoring measurement requires validated devices and standardized methods and appropriate education for self-monitoring also should be considered. And the self-monitoring needs motivation and guidance from the health providers to overcome the barriers of omission or inaccuracy.

It is recommended that self-monitoring of blood pressure should be important part of the comprehensive self-management program for hypertensive patients. To improve the self-monitoring activity, studies identifying the effective factors of self-monitoring are needed.

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고혈압 환자의 혈압자가측정에 관한 문헌고찰

박 영 임[1] · Susanna L.Cunningham[2]

1) 대전대학교 간호학과 교수, 2) 미국 워싱톤대학교 간호대학 교수, FAAN

연구목적: 고혈압환자의 효과적인 자가관리 간호중재를 개발하는데 필요한 기초자료로 혈압자가측정(self-monitoring of blood pressure)에 대한 특성, 장점, 범위 및 제한점을 파악한다. **연구방법:** 1996년부터 2005년까지 PubMed에 수록된 고혈압환자의 자가관리 방법중 혈압자가측정방법이 포함된 외국의 연구를 중심으로 체계적인 고찰을 실시하였다. 전체 69개 자가관리방법을 적용한 논문 중에서 혈압자가측정이나 가정에서의 혈압측정(home monitoring)에 대한 45개 논문을 선정하여 분석하였다. **연구결과:** 전반적으로 혈압자가측정 방법은 고혈압환자의 혈압조절을 향상시키는 효과가 유의한 것으로 나타났다. 환자가 혈압을 자가측정한 방법에서 평균 혈압, 수축기 혈압, 맥압이 유의하게 감소한 것으로 보고되었다. 장기적 프로그램에서 혈압조절율이 향상되거나, 이완기혈압의 감소효과도 보고되었다. 혈압자가측정의 기준치는 연구마다 일치하지는 않았지만 135/85mmHg 수준이 정상혈압의 상한수준으로 제시되었다. 일부 연구에서는 가정 내 혈압측정이 24시간혈압측정을 대체하는 방법으로 추천되었다. 보다 정확한 혈압자가측정을 위해서 신뢰성 있는 혈압측정기구의 사용과 정확한 측정방법이 환자들에게 교육될 필요가 있다. **결론:** 혈압자가측정은 고혈압환자의 혈압조절에 유용한 방법으로 고찰되었다. 또한 고혈압의 진단, 혈압치료와 고혈압 약물복용 행위를 향상시키는 교육적 효과도 긍정적으로 나타났다. 따라서 고혈압환자를 위한 효과적인 자기조절프로그램에 혈압자가측정법을 포함하는 것이 추천되며, 추후 한국에서 시도된 관련 연구에 관한 문헌고찰의 비교연구가 필요하다.

주요어 : 혈압자가측정, 고혈압, 문헌고찰

• *Address reprint requests to : Park, Young-Im*
Department of Nursing, Daejeon University
96-3 Yongun-dong, Dong-gu, Daejeon, 300-716, Korea
Tel: 82-42-280-2653 Fax: 82-42-280-2785 E-mail: park54@dju.ac.kr