

The Care Management Network as an Effective Intervention in Mitigating the Risks of Hypertension

Feng-Chuan Pan* and Fang-Yue Liu

Abstract—Hospitals in southern Hualien teamed with the Hypertension Joint Care Network. Working with the network, the team provided a special designed health education to the individual who had been identified as a hypertension patient in the outpatient department. Some metabolism improvements achieved. This is a retrospective study by purposively taking 106 patients from a hospital between 2008 and 2010. Records of before and after education intervention of the objects was collected and analyzed to see the how the intervention affected the patients' hypertension control via clinical parameter monitoring. The results showed that the clinical indicators, the LDL-C, the cholesterol and the systolic blood pressure were significantly improved. The study provides evidence for the effectiveness of the network in controlling hypertension.

Keywords—hypertension, joint care management network, cardiovascular diseases, metabolic syndrome.

I. INTRODUCTION

DISEASE pattern has sharply changed from the acute disease as the major threat to life to the chronic as the leading cause in Taiwan recently. Causes to this phenomenon are many, yet changes in citizens' lifestyle and dietary due to economic uplifting account for the most cases. The average life expectancy was 75.0 years old with 8.44% of the population aged over 65 years old in 1999. Along with the advanced medical technology and healthcare techniques, life expectancy is greatly extended to 80 years old (78.97 in 2009) with 12.75% of the elderly population in 2008 [1]. The even longer life expectancy and larger portion of aged people is foreseeable. This means people in Taiwan will live with various levels of chronic diseases in this society.

Death rates caused by hypertension and cardiovascular diseases started to grow for the people aged 45 to 50, and were the major death factors for an aging or aged society. As one of the major causes of hypertension, the lifestyle of taking high fat diet will induce the hypertension and cardiovascular diseases at the younger and younger ages.

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According to the Department of Health in Taiwan, the heart diseases and cerebrovascular diseases were second and the third on the top ten causes of death. The report further indicated that 3,721 died from hypertensive disease in 2009, at a rate of 16.1 per hundred thousand (16.1/100,000), the 8th in the top ten. Take the gender into consideration, 1,769 were female (15.5/100,000) and 1,952 were male (16.8/100,000). Many other diseases that cause high mortality rate were closely related with high blood pressure. Cook et al [2] indicated that each 2mmHg reduction in diastolic blood pressure can reduce 6% of cardiovascular disease, 15% of stroke and other incidences of transient cerebral ischemia. A Composite Risk Factor for Interference Test (MRFIT) that published by JAMA in 1982 reported, the coronary heart disease will increase 2% by per 1mg/dL increase in total cholesterol, and vice versa; the coronary heart disease will decrease 2-3% by per 1mg/dL HDL-C lowering. To reduce the risk of the coronary heart diseases, a strict control of blood pressure and cholesterol is critical.

A. Hypertension

The World Health Organization (WHO) expert meeting defined the hypertension in 1959 a blood pressure regularly exceeds the normal measures, of which are 139mmHg systolic and 89mmHg diastolic in blood pressure. In addition, a definite hypertension is the blood pressure exceeds 160mmHg systolic or more than 95mmHg diastolic in blood pressure [3]. In general, the blood pressure increased along with age, and the males are tending to suffer with hypertension than the females. Factors associated the variations of blood pressure other than gender and age, may include the difference in the race. Moreover, the blood pressures can be easily affected by environmental factors in indirect ways through an individual's emotion fluctuation [4].

Fifty-five percent of patients with moderate levels of hypertension and leave no treatment may suffer with cardiovascular disease after a five-year period, and certainly expose to a high risk of death. The patients with a mild level of hypertension received no treatment may have one percent of the possibility to die, 29% for complications of atherosclerosis (mainly coronary artery disease), 53% for severe hypertension complications (such as left ventricular hypertrophy, retinopathy, cerebrovascular disorders, kidney failure or heart failure) [4]. This means even a mild case of high blood pressure will also cause organ damage if not proper treated.

B. Treatment of Hypertension

Hypertension is a disease could be prevented and duly treated with current medical approaches. Treatment of hypertension may include two distinctive but associated approaches as medication and non-medication treatments. The former denotes a conventional medical treatment that is required to be performed by a qualified physician, while later may include changing lifestyle, maintaining ideal body weight, limiting salt intake, keeping adequate exercise, and avoiding other atherosclerosis risk factors. The atherosclerosis risk factors are such as hypertriglyceridemia, the improper amount of low density lipoprotein or high density lipoprotein cholesterol, among others. Appropriate treatment on hypertension can significantly reduce the rates of morbidity and mortality for all age groups. A lower blood pressure could be able to reduce the 35-40% incidences of stroke, 20-25% of myocardial incidences, and 50% of infarction and heart failure incidences [5]. Regular medication, diet control and proper exercise are the three measures that are normally included in a hypertension patient's prescription.

The prevalence of hypertension is high in Taiwan, yet more than half of the patients did not realize or even ignored this disease. Along with the inauguration of the National Health Insurance Policy in 1995, the Taiwan government initiated a reimbursement project specifically for the high blood pressure improvement in 2006. A Joint Care Management Network (JCMN) for hypertension was then organized to call for an inter-organizational cooperation. This project is designed mainly to utilize cross-institute healthcare resources and to integrate medication and non-medication approaches to train and educate patients a good approach of blood pressure controlling.

The case hospital was included in the JCMN in 2008. This paper reports the effectiveness of such a project by a retrospective study on the data gathered between 2008 and 2010.

II. MATERIALS AND METHODS

A. Samples

Objects were taken from the case hospital. The patients who were diagnosed as the codes initiated with 401, 402, 403, and 404 of The International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) by the physician. Information on the objects was accessed through the hypertension outpatient care network computer sign-on system. These patients had been receiving hypertension treatment for more than 12 months. The information to be analyzed contains 106 cases in the period of August 2008 and August 2010.

B. Process of Care Management Network

Team member for a JCMN unit includes physicians, qualified health educators, dieticians, laboratory specialists, and pharmacists to create appropriate measures for case management. The network gives specific medication and healthcare education as intervention. Interventions were

provided based on a set of data of each individual patient. This includes demographic data archiving, laboratory testing and inspection, and experimental data filing. Healthcare education includes medication identification instructions, awareness of hypertension risk factors, knowledge on hypertension complications, and diet. As part of the process, the network members deliver as well a substantial psychological support, and a follow up healthcare instruction to strengthen the patients' confidence and belief.

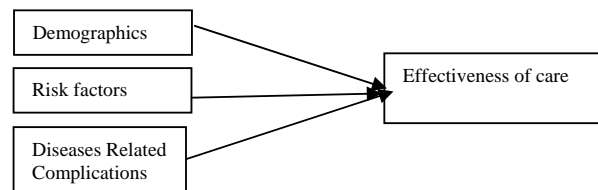


Fig. 1 Healthcare Intervention and Hypertension Control

C. Data Analysis

Other than taking the descriptive statistics to profile the objects' general representation, this research conducted several paired t-tests of major hypertension-associated indicators to measure the progress of the hypertension control. Indicators include LDL (low-density lipoprotein cholesterol), HDL (high-density lipoprotein cholesterol), TG (triglyceride), Chol (total cholesterol), BMI (body mass index), and glucose.

III. RESULTS

A. Sample Description

Samples of this study were described as the Table I. Female is the major gender with 64 cases (60.4%), and the male gender is 42 (39.6%). Ages of objects are ranging from 44 to 90 years old, among which 61-70 years old is the largest group (n= 35, 33%), followed by the age of 71-80 (31, 29.3%), and then 51-60 (24, 22.6%), 50 and lower (9, 8.4%), and 81 and over (7, 6.6%). Most of the objects were 61 years and older with 62.3% of the total sample with an average age at 66.09 years old (SD= 10.62). Linkage of hypertension and ages was high. There are 71 % of the objects received few or none education, and only eleven percent of objects received high school or above education. This may imply that the hypertension patients may lack of health knowledge due to very few educations. Health hazardous behaviors in this study are described as nearly 37 percent of them drink, and 36 percent smoke.

It is interesting to note that the percentages of these hazardous behaviors were not superstitiously high, and some of them even did not rely on smoke or alcohol. Hypertension typically occurred with several chronic disease or symptoms, such as this research indicated, 41 (38.67%) of the objects concurrently suffered with diabetes, 66 (62.26%) with high hyperlipidemia, 58 (54.71%) with cardiovascular diseases, and 5 (4.72%) with cerebrovascular disorders. Despite that the role as a cause or an outcome the hypertension played in this

context, it is for sure that these chronic diseases were closely related to each other.

TABLE I
DESCRIPTIVE STATISTICS (N=106)

V	Group	N	%	V	N	%	
Age	50-	9	8.40	Drinking history	Y	39	36.79
	51~60	24	22.66		N	67	63.20
	61~70	35	33.00	Smoking history	Y	38	35.84
	71~80	31	29.30		N	68	64.15
	81+	7	6.60	Diabetes	Y	41	38.67
Sex	Male	42	39.62		N	65	61.32
	Female	64	60.37	Hyperlipidemia	Y	66	62.26
Education.	<Elementary	45	42.45		N	40	37.74
	Elementary	30	28.30	Cardiovascular disease	Y	58	54.71
	Junior	19	17.93		N	48	45.28
	>High school	12	11.32	Cerebrovascular disorders	Y	5	4.72
Marital	Single	5	4.72		N	101	95.28
	Married	80	75.47				
	Divorced (widowed)	21	19.81				

Data from the initial stage and the third stage were collected to monitor the changes before and after the intervention, as shown in the Tables IIA and IIB. The average systolic blood pressure decreased 4.15 mmhg from a level of 139.24mmhg to a 135.09 mmhg ($p = 0.038$). The LDL dropped 14.77mg/dL from a 112.51mg/dL to a 97.74mg/dL 74mg/dL ($p=0.000$). The total cholesterol (Chol) was better off from a 190.38 mg / dL to a 174.24 mg / dL ($p = 0.000$) level.

TABLE IIA
DESCRIPTIVE STATISTICS OF INDICATORS

Dimension	N	Min.	Max.	Means	S. d.
Ini. blood pressure	106	90.0	200.0	139.24	19.052
Initial body weight	106	43.0	125.0	68.959	11.768
Initial BMI	106	19.0	53.6	27.89	4.46
Initial LDL	106	42.0	186.0	112.51	29.66
Initial HDL	106	24.0	78.0	44.02	9.71
Initial TG	106	39.0	519.0	172.41	107.67
Initial Chol	106	99.0	267.0	190.38	34.83
Initial blood glucose	106	62.0	401.0	164.62	65.28
3rd blood pressure	106	102	180.0	135.09	13.99
The third weight	106	42.0	124.5	68.819	11.65
Third BMI	106	19.9	53.4	27.85	4.45
Third LDL	106	40.0	183.0	97.74	29.63
Third HDL	106	23.0	79.0	44.96	10.72
The third TG	106	50.0	706.0	178.59	131.33
Third Chol	106	94.0	304.0	174.24	36.54
Third blood glucose	106	80.0	390.0	152.44	55.01

As far as the clinical practice concerned, physicians may rely on several indicators as criteria to measure the progress of a hypertension. Indicators of LDL-C, HDL-C, and the reading of blood pressure (systolic) were significantly improved. This analysis provided evidence that the intervention performed by the JCMN had a positive effect of blood pressure control.

TABLE IIB
INFERENTIAL STATISTICS, PAIRED SAMPLE T TEST

Pairs	Actions	Variation				t	
		Initial -3rd	Means ^a	S.D.	95% CI		
					Low		Upp
1	Blood press.	4.15	20.31	0.24	8.06	2.10*	
2	Body weight	0.14	2.77	-0.39	0.67	0.51	
3	BMI	0.00	1.14	-0.18	0.26	0.34	
4	LDL	14.77	36.11	7.82	21.73	4.21***	
5	HDL	-0.93	7.09	-2.3	0.43	-1.35	
6	TG	-6.18	80.69	-21.72	9.36	-0.78	
7	Chol	16.14	36.40	9.13	23.15	4.56***	
8	Blood glu.	12.18	64.97	-0.33	24.69	1.93	

^a Values are the initial versus the third

* $p < 0.05$; ** < 0.01 ; *** < 0.001

IV. DISCUSSION AND CONCLUSION

Research generally agreed that the metabolic syndrome (a symptom that was judged by five criteria of obesity, hypertension, glucose intolerance, hypertri-glyceridemia and low high-density lipoprotein cholesterol) for a woman occurred later in age than those for a man [6]. Some argued that the prevalence rate of metabolic syndrome was higher in the male gender. However, some further studies indicated the prevalence rate of this syndrome for women became higher than the male in the groups of aged over 60 [7]. Current research had provided further evidence with the sample from eastern part of Taiwan.

This research reported that the complications associated with the hypertension in this study accounted for 62.26% of hyperlipidemia, 54.71% of cardiovascular disease, 38.67% of diabetes, and 4.72% of cerebrovascular disorders. This is consistent with the previous studies who had revealed the hypertension as a major risk factor to atherogenic dyslipidemia [8], and the coronary heart disease and consequently, the incidence of cerebral stroke [9].

Patients visit a physician for couple minutes and return home with medical orders and a prescription (mostly medicine for couple days from the pharmacy department of the hospital). This is the typical pattern for a physician visiting in the hospital. Patients remain strange about what were the causes and the progress of such a disease. This means the patients may not be able to accumulate the disease knowledge after such a visiting. Like case management that had been adopted for years, the JCMN improved the puzzle. An individual specific control program is a kind of intervention that is not only helped

monitoring clinical indicators, providing customized health education, and facilitating the controlling process, but also providing timely advice and strengthens the individual's self-efficacy for blood pressure control.

A patient's compliance tends to decline gradually along with a process of medical treatment [10]. The compliance decreases sharply in the second year of a long-term treatment project [11]. Patients involved in the JCMN appeared to have the similar pattern. High percentage of patients terminated soon after three times of examination in the first year. A continuous treatment is critical for a satisfactory chronic disease control, so as the hypertension. It is thus a challenge for the JCMN and the healthcare professionals to motivate the objects keeping close cooperation with the healthcare professionals..

REFERENCES

- [1] Department of Health. *Statistics and Information Network*. <http://www.doh.gov.tw/statistic/index.htm>, 2010. (Accessed 2010-11-01).
- [2] N. R. Cook, J. Cohen, P. K. Hekbert, et al., "Implications of small reductions in diastolic blood pressure for primary prevention," *Arch Intern Med*, vol. 155, pp.701-709, 1995.
- [3] Guidelines Subcommittee, World Health Organization. World Health Organization-International Social of Hypertension. *J Hypertension*, vol. 17, p.151, 1999.
- [4] T. C. Chang, and National Taiwan medical University, *The Internal Medicine*. Taipei: Modern Medicine publisher, 2004. (In Chinese).
- [5] Y. Z. Tseng, "Complication of hypertension," http://www.hypertension.org.tw/dl/d_16.doc, 2010. (Access 2010/11/7). In Chinese.
- [6] S. M. Haffner, R. A. Valdez, H. P. Hazuda, B. D. Mitchell, P. A. Morales, and M. P. Stern, "Prospective analysis of the insulin-resistance syndrome," *Diabetes*, vol. 41, pp.715-22, 1992.
- [7] L. C. Hwang, *The Prevalence of Metabolic Syndrome in Taiwan and the Incidence of Metabolic Syndrome Development: Sex Differences*. Unpublished master thesis, National Taiwan University, Taipei, 2006. In Chinese.
- [8] N. Sattar, A. Gaw, O. Scherbakova, et al., "Metabolic syndrome with and without C-reactive protein as a predictor of coronary heart disease and diabetes in the West of Scotland: A coronary prevention study," *Circulation*, vol. 108, pp.414-419, 2003.
- [9] J. D. Otvos, E. J. Jeyarajah, and W. C. Cromwel (2009). Measurement issues related to lipoprotein heterogeneity. *Amer J Cardiol*. vol. 90, 22i-29i, 2009.
- [10] C. N. Sadur, N. Moline, M. Costa, et al. "Diabetes management in a health maintenance organization-efficacy of care management using cluster visits," *Diabetes Care*, vol. 22, pp.2011-2017, 1999.
- [11] M. Kirkman, S. Williams, H. Caffrey, et al., "Impact of a program to improve adherence to diabetes guidelines by primary care physicians," *Diabetes Care*, vol. 25, pp.1946-1951, 2002.