Original Article

Hypertension Management in Primary Care: Feasibility of Using the Omaha System as a Clinical Information System

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Abstract

Background and aim: There is a need for new approaches and a focus on development of health information technologies for effective hypertension management. The Omaha System is comprehensive, evidence-based, holistic assessment tool for documenting, organizing, and storing clinical data. The aim of this study was to evaluate the problems, nursing interventions and care outcomes of hypertensive individuals in primary care with using the Omaha System, and to examine feasibility of using the Omaha System as a clinical information system in hypertension management.
Methodology: The sample included 88 hypertensive patients who taking health care services from the two family healh centers in Istanbul. Manual and electronic forms of the Omaha System were used as the assessment instrument.
Results: Identifed problems were respectively; circulation, nutrition, physical activity, medication regimen, mental health, substance use, health care supervision, sleep and rest patterns, and income. In all selected problems except income; knowledge, behavior and status scores increased significantly.
Conclusion: The feasibility of the Omaha System as a guideline to timely and holistic assessment of hypertensive patient in primary care was demonstrated.

Key words: Hypertension, chronic disease management, clinical information system, Omaha System, primary care.

Introduction

Hypertension, which is a serious public health problem all over the world; is also the risk factor for many diseases (heart disease, stroke, kidney disease etc.) and the cause of premature death and disability. Although early diagnosis of hypertension is vital; many people cannot be diagnosed, all of them cannot be treated or cannot keep it controlled (WHO, 2013; CDC, 2016). Global cardiovascular diseases account for one third of the total deaths (nearly 17 million deaths), and 9.4 million of these are due to hypertension. In addition, the disease accounts for 45% of heart disease-related deaths and 51% of stroke-related deaths (WHO, 2013). Similar to global data, three out of every 10 people have hypertension in Turkey. Moreover, 57.1% of people with high blood pressure are not receiving treatment and blood pressure is under control in 23.8% of hypertensive patients (Uner, Balcilar & Erguder, 2018). Although there are many internationally accepted evidence-based guidelines and opportunity for population-based programs for hypertension management, the current situation in management of hypertension is considerably lower than expected; there are high prevalence, high cost, care coordination needing, global quality gap of care (McBride, Ferrario & Lyle, 2003; Goldstein, 2008; Akalin, Durusu & Sayran, 2012).

As a result of increasing social and economic burden in disease management, the Chronic Care Model that has been put forward as a guide to improve the quality of care, improve care outcomes and reduce costs is one of the best known and most frequently used evidence-based models (Piatt & Zgibor, 2007; Beaglehole et al. 2008; Incirkus & Nahcivan, 2015). The purpose of the Chronic Care Model is to change the daily care of individuals with chronic illness from acute and curative care to preventive, planned and community-based care. With the model based chronic disease management, patients are routinely identified, actively participated to their care, informed in detail, and supported for self-management. Thus, improvements in care results and quality, patient satisfaction are expected (Incirkus & Nahcivan, 2015). Clinical information systems, one of the six basic components of the model, provide and organize the necessary data in a timely manner to provide effective and efficient service and high quality coordinated chronic disease management (Wagner et al. 2001; Epping-Jordan et al. 2004).

Collecting the health records via computer and using of new technologies and informatics is central feature of the hypertension management. These situations require a need for new approaches and a focus on development of information technologies and informatics for effective, multidisciplinary and patient-centered hypertension management (McBride, Ferrario & Lyle, 2003; Goldstein, 2008; Akalin, Durusu & Sayran, 2012). It has been shown in several study and review reports that using health information technologies and informatics will provide; improving care outcomes and quality, patient safety and integrated care, easy and rapid access to patients data and health literature, developing care standards, disease-based decision support and transparency, setting up the national or international information network, continuity of chronic disease management, constituding of a repayment systems, improving the health literacy, and creating a database for scientific research. It will also bring about reduce costs and medical errors, increase coordination, and communication between health professionals and patients (Raymond & Dold, 2002; Shekelle, Morton & Keeler, 2006; Goldstein, 2008; Lundberg et al, 2008; Akalın, Durusu & Sayran, 2012). The use of health information systems will provide the coordination of services, disease-specific evidence-based practices, evalution the impact of hypertension in the world, comprehensive patient assessment, documentation and, follow-up (Raymond & Dold, 2002; Monsen & Oftedahl, 2012; Zhu, Wong & Wu, 2014).

The Omaha System is a research-based classification and information system, a valid/reliable and comprehensive interface terminology for managing complex health conditions. It was initially developed for home care and then expanded to other community and healthcare settings (Martin, 2005). In addition to an integrated and holistic approach to strengthening the care and self-management of chronic diseases; by taking the individual as a whole, it allows to identify the individual with all its strengths and weaknesses (Monsen et al. 2014). After testing the usability of the Omaha System in Turkish language (Erdogan & Esin, 2006), effectiveness of the system has been demonstrated in various fields from homecare to occupational health, from acute care to long-term care in Turkey (Isci & Esin, 2009; Aylaz et al. 2010; Kesgin, 2010; Dilli, 2011; Kulakci & Emiroglu, 2011; Ozturk, 2011; Erdogan et al. 2013; Cosansu, Cangol & Erdogan, 2014; Secginli, Kayaoglu & Erdogan, 2014; Aktas et al. 2017). On the other hand, studies about the usefulness of the Omaha System for hypertension management in primary health care are limited and there is a need research evidence in this field for health care professionals. Moreover, it is reported that most of the software used in our country under the name of hospital information management systems includes modules such as billing systems, stock control and personnel applications; and health information management systems, including electronic health records and clinical decision support systems, are very little (TTB, 2011). The aim of this study was to evaluate the problems, nursing interventions and care outcomes of hypertensive individuals in primary care with using the Omaha System, and to examine feasibility of using the Omaha System as a clinical information system in hypertension management.

Methodology

Study design and sample: This descriptive study was conducted as part of an experimental study aimed to evaluate the results of the motivational interview-based self-management support program for hypertensive patients

(Incirkus & Nahcivan, 2017). The sample of intervention group (n=58) from the main study was expanded and Omaha System codes and concepts were used to record the data manually and electronically. Therefore, in this study was aimed to determine that the Omaha System is a feasible and a useful data collection tool to evaluate the problems, interventions, and outcomes in the management of hypertension patients.

The study was carried out in family health centers, which provide primary services to people with chronic diseases. The sample of the study included 88 hypertensive patients selected from two different family health centers, İstanbul, Turkey. Fifty-eight patients in the sample were taken from the previous intervention study (Incirkus and Nahcivan, 2017), and then 30 patients who were purposively selected were added in the study sample. The sample included hypertensive individuals who received services from these centers in Istanbul between January 2014 and June 2015, 18 and over age, having no any hearing-visual and mental problems, and agreed to participate in the study. Patients with myocardial infarction, acute coronary syndrome, stroke, bypass, Alzheimer's disease, diabetes, psychiatric disease, recent cancer or malignancy were excluded from the study.

Data collection procedures and instruments: Data were collected via face-to-face interview by one of the author (K.I.) in an empty interview room in family health centers. Minimum three and maximum four interviews were made for each patient and each interview lasted an average of 30 minutes. The interview form and the Omaha System manual and electronic forms were used as the assessment instrument. Socio-demographic and health data (age, gender, education, marital status, working status, having health insurance, having comorbidity, susbstance use, year of diagnosed of hypertension) collected with “interview form” developed by authors based on literature. Omaha System data collected with the Omaha System manual and electronic forms.

The Omaha System consists of interrelated three components: (1) *Problem Classification Scheme* that includes four domains is environmental; psychosocial; physiological; and health-related behaviors. These domains consist of 42 problems, which are identified by unique definitions and associated signs/symptoms. (2) *Intervention Scheme* that describes healthcare activities provided to individuals, families, or communities. This scheme consists of four categories of activities are: teaching, guidance, and counseling; treatments and procedures; case management; and surveillance and an alphabetical list of 75 targets. (3) *Problem Rating Scale* that provides a method for evaluating progress in relation to identified problems, using a Likert scale is rating range from 1 (lowest) to 5 (highest) knowledge, behavior, and status for each problem (Martin, 2005; Erdogan et al, 2013). Health problems of participants with *Problem Classification Scheme,* interventions with *Intervention Scheme,* knowledge, behavior and status outcomes with *Problem Rating Scale* were documented. The manual and electronic forms of the Omaha System were used with the permission of the Istanbul University Department of Public Health Nursing, which carried out the adaptation of the system and its electronic version to Turkish.

Ethical considerations: After receiving the institutional permission, the study was approved by the Ethics Committee of Zeynep Kamil Maternity and Children Training and Research Hospital, Istanbul/Turkey (Approval number: 045, date: April 5, 2013). All patients were informed about the study, and written consent was obtained before data collection.

Statistical analysis: The data were evaluated by using SPSS (Client version 21.0) program and Turkish-*Nightingale Notes* program. Turkish-*Nightingale Notes* is a Turkish version of the program developed by Champ Software based on the Omaha System for use in nursing education and research. The program was prepared by Pasifik Company, in collaboration with the faculty of the Department of Public Health Nursing, Istanbul University-Cerrahpaşa Florence Nightingale Faculty of Nursing (http://www.omahasistem.com/). Graduate students of the faculty public health nursing department are licensed users of this program. Descriptive data were analyzed using frequency, percentage, minimum-maximum, mean, standard deviation. The t-test was used for differences between means. There was no missing data. The significance level of $p<0.05$ was considered.

Results

Socio-demographic characteristics of participants are shown in Table 1. Most of the sample was; women (62.5%), primary school graduate (44.3%), married (81.8%), non-employed

(87.5%), having health insurance (79.5%), and comorbidity (55.7%). Mean age was 54.70 ± 7.97 (min-max= 25- 82), and mean of year of diagnosed hypertension was 8.22 ± 8.54 (min 1, max 40). The 61.4% of participants did not smoke or drink alcohol.

Table 1 Socio-Demographic Characteristics of the Participants (n=88)

Socio-demographic characteristics		n	%
Gender	Female	55	62.5
	Male	33	37.5
Education	Literate	12	13.6
	Primary School	39	44.3
	Middle School	12	13.6
	High School/University	25	28.5
Marrital Status	Married	72	81.8
	Single	16	18.2
Having Health Insurance	Yes	70	79.5
	No	18	20.5
Working Status	Yes	11	12.5
	No	77	87.5
Having Comorbidity	Yes	49	55.7
	No	39	44.3
Substance Use Statement	Disuse	54	61.4
	Smoking	24	27.3
	Alcohol	10	11.3
Age X ± SD (min-max)		54.70 ± 7.97 (min-max= 25-82)	
Years with Hypertension X ± SD (min-max)		8.22±8.54 (min-max= 1-40)	

Table 2 Problems of the Participants According to the Omaha System Domains (n=88)

Domain	Problem	Frequency	%
Physiological	**Total**	**78**	**24.5**
	Circulation	78	24.5
Health Related Behaviors	**Total**	**207**	**65.1**
	Nutrition	58	18.3
	Physcial Activity	57	17.9
	Medication Regimen	32	10.1
	Substance Use	28	8.8
	Health Care Supervision	21	6.6

	Sleep and Rest Patterns	11	3.4
Psychosocial	**Total**	**30**	**9.5**
	Mental Health	30	9.5
Environmental	**Total**	**3**	**0.9**
	Income	3	0.9

Table 3 Paired Samples *t*-test for Knowledge, Behavior and Status Outcomes

Knowledge	**Initial**	**Final**	**Mean Difference**	**t**	**p**
Circulation	2.56	3.79	-1.23	-16.40	0.000*
Nutrition	2.33	3.55	-1.22	-11.41	0.000*
Physical Activity	2.33	3.46	-1.12	-9.55	0.000*
Medication Regimen	2.25	3.60	-1.44	-9.68	0.000*
Mental Health	2.33	3.50	-1.17	-9.87	0.000*
Substance Use	2.82	3.29	-0.46	-3.30	0.003*
Health Care Supervision	2.14	3.38	-1.24	-7.38	0.000*
Sleep and Rest Patterns	2.73	3.64	-0.91	-4.30	0.002*
Income	1.67	2.33	-0.67	-2.00	0.184
Behavior	**Initial**	**Final**	**Mean Difference**	**t**	**p**
Circulation	2.37	3.23	-0.86	-9.66	0.000*
Nutrition	1.90	2.84	-0.95	-9.24	0.000*
Physical Activity	1.53	2.56	-1.04	-9.25	0.000*
Medication Regimen	2.16	3.03	-0.88	-6.24	0.000*
Mental Health	1.63	2.77	-1.13	-7.58	0.000*
Substance Use	1.82	2.54	-0.71	-5.74	0.000*
Health Care Supervision	1.81	2.81	-1.00	-4.83	0.000*
Sleep and Rest Patterns	1.45	2.55	-1.09	-4.35	0.001*
Income	1.00	1.67	-0.67	-1.00	0.423
Status	**Initial**	**Final**	**Mean Difference**	**t**	**p**
Circulation	2.54	3.17	-0.63	-6.49	0.000*
Nutrition	1.74	2.41	-0.67	-6.75	0.000*
Physical Activity	1.56	2.25	-0.68	-6.80	0.000*
Medication Regimen	2.31	2.91	-0.59	-5.05	0.000*
Mental Health	1.57	2.67	-1.10	-7.50	0.000*
Substance Use	1.89	2.32	-0.43	-3.58	0.001*
Health Care Supervision	1.81	2.90	-1.10	-5.32	0.000*
Sleep and Rest Patterns	1.45	2.36	-0.91	-3.19	0.010*
Income	1.00	1.33	-0.33	-1.00	0.423

***** $p<0.05$, statistically significant

A total of 318 Omaha System problems (more than one problem was selected for one person) in four domain were identified for the 88 participants included in the sample. The most frequent problems were in the *health-related behavior* domain (65.1%). The problems identified in the health-related behavior domain were as follows; nutrition (18.3%), physical activity (17.9%), medication regimen (10.1%), substance use (8.8%), health care supervision (6.6%), and sleep and rest patterns (3.4%). The second frequent domain was *physiological* (24.5%) and only circulation problem was selected in this domain. The third frequent domain was *psychosocial* domain (9.5%) including mental health problem. *Environmental* domain was found to be quite low (0.9%) and only income problem was selected in this domain (Table 2).

The interventions to solve the selected problems were explained with 4745 data inputs. These interventions were in *surveillance* (59.1%, n=2803), *teaching guidance and counselling* (25.6%, n=1216), *case management* (13.7%, n=651), and *treatments and procedures* (1.6%, n=75) categories, respectively. Total of 33 of the 75 targets (total target inputs were 2719) included in the Intervention Scheme of the Omaha System were used to create a care plan for the identified problems. The most frequently selected intervention and target was *surveillance-signs/symptoms physicial* and the least frequently selected intervention and target was *teaching guidance and counselling-finance/financial affairs*.

The initial and final results for knowledge, behavior and status outcomes of participants were shown in Table 3. In all selected problems except income, knowledge, behavior and status scores increased significantly in paired samples t-tests ($p<0.05$) in final measurements. Only in income problem, the difference in knowledge, behavior and status scores was not statistically significant. In Knowledge rating; the mean difference between initial and final measures was the highest for *medication regimen* (1.44), while the lowest for *substance use* (0.46) problem. In Behavior rating; the mean difference was the highest for *mental health* (1.13), while the lowest for *income* (0.67) problem. In Status rating; the mean was the highest for *mental health* and *health care supervision* (1.10), while the lowest for *income* (0.33) problem.

Discussion

The main purpose of this study was to investigate the feasibility of using the Omaha System as a clinical information system in the management of hypertension in primary care. The results of the study showed that the Omaha system is useful and feasible for assessing care problems, interventions and care outcomes of hypertensive patients receiving services from a family health center with limited information technology for patient-centered hypertension management.

The majority of the sample included patients with co-morbidities, women, married, primary school graduate, non-employed, having health insurance, not use of cigarettes or alcohol. Mean age of the patients was 54.70 ± 7.97 (ranged from 25 to 82 years), and the mean year of diagnosis of hypertension was high (8.22 ± 8.54 years). Similarly, in the studies about prevalence of hypertension and a systematic review of prevalence of hypertension in Turkey, the majority of the hypertensive population consisted of women, mean of 54-56 years old and primary school graduates (Sengul et al. 2016; Kılıçkap et al.2018). In a prevalence study in Turkey, most of the sample consisted of women, 30-44 years old, married, primary school graduates, unpaid/retired, not use of cigarettes or alcohol (Uner, Balcilar & Erguder, 2018). Accordingly, it can be said that the sample of this study was similar to the national studies applied in large sample groups.

When Omaha System data was examined; almost all problems identified in this study (circulation, nutrition, physical activity, health care supervision, medication regimen, and substance use) were among the most frequently associated with hypertension (role change, respiration, circulation, nutrition, physical activity, health care supervision, medication regimen) and cardiac rehabilitation (circulation, health care supervision, medication regimen, nutrition, physical activity, substance use) (Martin, 2005; Monsen & Oftedahl, 2012). In addition, the selected Omaha System problems were related to recommended and preventable lifestyle changes for hypertension management in the international reports and guidelines (JNC, 2004; North of England Hypertension Guideline Development Group, 2004). The most frequently identified problem was circulation with sign/symptoms of abnormal blood pressure in this study. Considering that the whole sample consists of

hypertensive individuals, it was not surprising that these were the most common problem and sign/symptom. The least frequently identified problem was income with sign/symptoms of low/no income. This was also an expected result, since income problem was not directly related to hypertension management. Similarly, the most common problems in this study were consistent with the studies which shown feasibility of the Omaha System in home care, nursing centers, and clinic (Martin, Scheet & Stegman, 1993; Brooten et al. 2003; Thompson et al. 2012). However, this result varied in the studies which applied in home care and primary health care centers. The most frequently selected problems were skin, neuro-musculo-skeletal function, personal care and digestion-hydration problems in these studies which mainly composed of the sample that was elderly and received home care services (Westra et al. 2010; Dilli, 2011; Kulakci & Emiroglu, 2011; Erdogan et al. 2013; Aktas et al. 2017). The reason for this result may be that the sample and health care services in the selected studies varied, and that this study purposefully consisted of hypertensive individuals.

The problems identified in other studies that used of the Omaha System were mainly related to *physiological* domain (Aylaz et al. 2010; Westra et al. 2010; Dilli, 2011; Kulakci & Emiroglu, 2011; Ozturk, 2011; Erdogan et al, 2013; Aktas et al. 2017). On the other hands, in the studies which in majority of the sample were patients with cardiac and chronic diseases, the most frequently selected Omaha problems have been from the *health related behaviors* domain (Brooten et al. 2003; Monsen et al. 2014). In this study, the most of the documented problems were related to the *health related behaviors* domain (65.1%) and it was followed by *physiological* (24.5%), *psychosocial* (9.5%) and *environmental* (0.9%) domain. Adoption of healthy lifestyle behavior is a part of everyday life in chronic disease management, for this reason it was not surprising that problems related to healthy lifestyle changes were identified in the health related behaviors domain (Monsen et al. 2014).

For solving the identified problems in this study, used intervention categories were in order to; (1) surveillance, (2) teaching, guidance and counseling, (3) case management, (4) treatments and procedures. The most frequent used interventions were *surveillance* and *teaching, guidance and counseling*. Surveillance and counseling were the most effective interventions in this process, because most of diagnosed problems were related to *health related behaviors* domain (Westra et al. 2010). Considering the importance of monitoring blood pressure and other clinical outcomes, and gaining healthy lifestyle behaviors in the hypertension management, the results of this study show consistent results with global guidelines (JNC, 2004; NICE, 2011). Similarly, in the other Omaha System studies while the most frequent used interventions were in *teaching, guidance and counseling* and/or *surveillance* categories (Martin, Scheet & Stegman, 1993; Dilli, 2011; Kulakci & Emiroglu, 2011; Erdogan et al. 2013; Secginli, Kayaoglu & Erdogan, 2014).

In all selected problems except income; knowledge, behavior and status scores increased significantly. Only in income problem, the difference between initial and final measures in knowledge, behavior and status scores was not statistically significant. In other studies in our countries have been reported that have seen significant improvements in all three (knowledge-behavior-status) outcome parameters (Kulakci & Emiroglu, 2011; Erdogan et al. 2013; Secginli, Kayaoglu & Erdogan, 2014), but in Dilli's study (2011) have shown significant improvements in status parameters only.

Conclusion: The usefulness of the Omaha System as a guideline to timely and holistic assessment of the problems, interventions and care outcomes of hypertensive patients in primary care was demonstrated in this study. In this respect, the use of the Omaha System may facilitate to multidisciplinary and patient-centered hypertension management for healthcare professionals. It will also provide internationally comparisons which including to management of other chronic diseases and patient populations.

Despite all the positive results of this study, the small size of the sample and data collection study in the short term are the limitations of the research. Moreover, the Omaha System is not widely used in primary care in Turkey so data can not be compared with the existing system. In this respect, further researches are recommended to include larger samples and study with long-term follow-up. In the context of this study, since part of the research sample consisted of the intervention group of the previous experimental

study, this intervention may have improved the Omaha system outcomes. It is recommended to plan the necessary arrangements and programs to standardize the interventions for integrate the Omaha System into the existing system within the scope of electronic information systems. With the use of the Omaha System by health professionals in chronic disease management; improving integrated care and outcomes, coordination and communication between health professionals and patients, easy and rapid access to comprehensive patients data, facilitating to develop care standards, disease-specific evidence-based practices, continuity of chronic disease management, constituding of a repayment systems, and creating a database for scientific research will provide.

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