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ORIGINAL ARTICLE

Omaha System-based discharge guidance improves knowledge and behavior in Mainland Chinese patients with angina who are not receiving interventional treatment: A randomized controlled trial

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Abstract

Aim: To test the effectiveness of discharge guidance based on the theoretical framework of the Omaha System on Mainland Chinese patients with angina without interventional treatment.

Methods: A randomized controlled trial was conducted on 150 Mainland Chinese patients with angina without interventional treatment between December, 2015 and September, 2016. The participants were randomly allocated to discharge guidance based on the Omaha System or usual care. The participants were assessed with the self-designed Problem Rating Survey Scale, including three dimensions and seven items. The Cronbach's alpha coefficient was 0.81. The 7-item-level content validity index was 0.80–1.00 and the scale-level content validity index was 0.94.

Results: The scores of the outcome measures differed significantly between the two groups at all three time points (admission day; 3 days before discharge; discharge day) and increased gradually. Improvements in knowledge, behavior , and the total score of the intervention group were significantly higher than those of the control group. An improvement in status did not differ significantly.

Conclusion: The Omaha System-based discharge guidance is effective at enhancing knowledge and behavior in patients from Mainland China with angina without interventional treatment.

Key words: angina, behavior, knowledge, Omaha System.

INTRODUCTION

In recent years, the number of patients with chronic diseases has risen rapidly in China, reaching 260 million. The most common diseases are cardiovascular and cerebrovascular diseases, diabetes, malignant tumors, and respiratory diseases. Angina has a high disease burden and its prevention and control are a new challenge. Managing patients with angina continues to place a significant burden on healthcare services; therefore, clinical efficiency and the timeliness of revascularization need to improve and provide cost savings (Lee *et al.*, 2016).

Interventional and non-interventional methods are both applied in angina treatment. The results of studies on the effectiveness of these two therapeutic approaches are not consistent. One study has shown that, compared to optimal medical therapy, percutaneous coronary intervention reduces major adverse events and is an effective treatment modality in patients with angina (Won *et al.*, 2015). There are also several studies that have not been able to prove which therapeutic approach is better, including a meta-analysis of randomized controlled trials (Thomas, Gokhale, Boden, & Devereaux, 2013) and a retrospective study to assess treatment outcomes (Lufeng, Rongjing, & Dayi, 2016). At present, there are many hospitalized patients with angina in China who still opt for non-interventional therapy. They need to maintain a healthy lifestyle to slow disease progress.

Transitional nursing is part of holistic nursing and an extension of hospital care. Some heart diseases among older adults might be prevented if effective short-term,

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postdischarge planning and monitoring of interventions are developed and implemented (Wolinsky *et al.*, 2010). Patients who are newly diagnosed with chronic diseases manage everyday changes due to illness according to a transitional pattern by which self-management is developed and maintained over time (Audulv, 2013). Discharge training and counseling services increase self-care ability and reduce postdischarge problems in patients with heart disease (Cebeci & Celik, 2008). During the period of transition, patients commonly misunderstand medication instructions, placing them at risk for under- or over-dosing (Berry *et al.*, 2014). Failure to provide complete discharge instructions results in non-adherence to treatment regimens and it is also one of the most common reasons for the acute exacerbation and readmission of patients with chronic diseases (Manning, 2011). Education programs have been shown to improve nurses' knowledge and attitude towards discharge planning (Suzuki *et al.*, 2012). Nurses often underestimate or inappropriately perceive the discharge information needs of patients (Yiu, Chien, Lui, & Qin, 2011). The present discharge guidance for patients with angina without interventional treatment is unsatisfactory.

Patient education is an essential part of rehabilitation. Discharge guidance is a key part of health education. Systems and processes are needed to facilitate educational delivery during discharge from hospital (Albert *et al.*, 2014). Using specific healthcare personnel, such as that of a discharge coordinator, has been successful in reducing hospitalization in patients with chronic diseases (Farkas, Kadivec, Kosnik, & Lainscak, 2011). The nurse-coordinated, hospital-based prevention program, in addition to usual care, is a practical, yet effective, method for reducing cardiovascular risk in patients with coronary disease (Jorstad *et al.*, 2013). Developing an evaluation system of intervention projects in order to facilitate quality improvement is needed, which potentially might result in better patient outcomes (Driscoll *et al.*, 2011).

The Omaha System was developed by the Visiting Nurse Association of Omaha (USA) in the 1970s as a new nursing practice classification system that targets community nursing practice. It is a research-based, comprehensive, standardized terminology to measure the impact of healthcare services (Radhakrishnan, Martin, Johnson, & Garcia, 2016). The Omaha System has a high level of potential to provide meaningful information about healthcare services (Topaz, Golfenshtein, & Bowles, 2014). Data from the Omaha System has been helpful for population health management (Olsen, Thorson, Baisch, & Monsen, 2017). Research by using the Omaha System data that have been generated by clinicians has the potential to reveal new knowledge related to guideline use and effectiveness (Monsen *et al.*, 2012). The Omaha System appears to be a promising strategy for the electronic exchange of population health assessments (Kerr *et al.*, 2016). One study has demonstrated the utility of the Omaha System for the possible expansion into acute care to standardize communication between the hospital setting and home care (Bowles, 2000). The Omaha System is a standardized tool and provides a complete method for measuring patient outcomes (McGourthy, 1999). At present, research in transitional nursing in other countries mostly focuses on intervention and follow-up after discharge, with less emphasis on discharge guidance. Research on the Omaha System began in the early 21st century in China, lagging behind overseas countries by >30 years. The system enables the meaningful use of clinical data to support and improve patient-centered clinical practice (Martin, Monsen, & Bowles, 2011). The results of this study could contribute to the further dissemination of the Omaha System and broaden the evidence base for the effective implementation of strategies for discharge guidance.

METHODS

Study design

This was a randomized controlled trial. A predefined computerized block randomization (the block size was two or four) process was conducted to randomly allocate 150 participants into the intervention group (n = 75) and the control group (n = 75). A health promotion protocol that was implemented by the duty nurses and that included discharge guidance based on the theoretical framework of the Omaha System was tested in comparison with discharge guidance without it to evaluate the impact on the outcomes in the 3 days before discharge. The participants in both groups were assessed for the outcomes at three time points by the duty nurse: the day of admission (T1), 3 days before discharge (T2), and the day of discharge (T3). The demographic characteristics, including sex, age, and educational level, were collected by using an additional form.

Setting and samples

The participants were inpatients in a cardiovascular ward in a 5000 bed tertiary hospital in north-east

China from December, 2015 to September, 2016. The eligible patients had to meet the following inclusion criteria: (i) a diagnosis of coronary heart disease that was confirmed by a physician, based on the clinical symptoms, signs, and auxiliary examination; (ii) hospitalized for coronary heart disease for the first time; (iii) age of ≥18 years; (iv) not considering interventional treatment on the admission day (i.e. percutaneous coronary intervention); (v) able to communicate in Chinese; and (vi) agreed to participate in the study. The exclusion criteria were: unstable vital signs; a history of tumor or mental illness; and an inability to communicate.

The demographic characteristics and baseline data of the outcomes were collected by the duty nurse at T1. Those who were randomized to the control group received the usual care. Those who were randomized to the intervention group received the usual care plus discharge guidance based on the theoretical framework of the Omaha System from 3 days before discharge to the day of discharge. The duty nurse collected the data of the outcomes at T2 and T3.

Ethical considerations

The study was conducted in accordance with the Declaration of Helsinki and was approved by the institutional review board of Shengjing Hospital, China Medical University, Shenyang, China (Approval no. 2015PS292K). The researchers explained the purpose and ethical principles of the study in detail to the participants. Informed consent was obtained from all the participants before data collection. Each participant was assured of confidentiality, anonymity, and the option to decline participation or to withdraw from the trial at any time without penalty.

Theoretical framework

The Omaha System was developed by the Visiting Nurse Association of Omaha (USA) in the 1970s and is used to classify health problems. The Omaha System has three components: problem classification scheme, intervention scheme, and Problem Rating Scale for Outcomes. The content levels in the problem classification scheme are domains, problems, severity modifier (actual, potential, and health promotion) and identity (individual, family, and community) modifier, and signs and symptoms. The content levels in the intervention scheme are category, target, and specific information. The content levels in the Problem Rating Scale for Outcomes are knowledge, behavior, and status.

Instruments

Problem Rating Survey Scale

Introduction to the Problem Rating Survey Scale. The Problem Rating Survey Scale was a self-designed instrument that was based on the theoretical framework of the Problem Rating Scale for Outcomes of the Omaha System and the secondary prevention strategies for coronary heart disease. The scale included three dimensions and seven items. The three dimensions were knowledge, behavior, and status. The seven items were diet knowledge, medication knowledge, exercise knowledge, diet behavior, medication behavior, exercise behavior, and status. All of them used a 5-point Likert scoring method, ranging from 1 ("lowest") to 5 ("highest"). The scores for the three items about knowledge (behavior) were averaged to form a score for the knowledge (behavior) outcomes of the scale. Higher scores indicated better outcomes of care.

Reliability of the Problem Rating Survey Scale. It was concluded that the Cronbach's alpha coefficient of the Problem Rating Survey Scale was 0.81. This was concluded through preliminary experiments with 40 participants who met the criteria before the start of the formal research. The reliability of the survey scale was high.

Validity of the Problem Rating Survey Scale. The expert group was formed by inviting five experts from the fields of nursing or cardiovascular internal medicine. The experts evaluated the correlation degree between the items of the Problem Rating Survey Scale and the research content. It was calculated that the 7 item-level content validity index was 0.80–1.00. It was calculated that the scale-level content validity index was 0.94. The content validity of the survey scale was good.

Procedure

The duty nurses from the study sites underwent 2 h of structured training on how to implement the interventions. The training program comprised a study introduction, the Omaha System, practical exercises, and discussion. H. D., as one of the main researchers, was there during the study and evaluated the duty nurses' performance to maintain fidelity.

The eligible participants who were randomly assigned to the control group received the conventional discharge guidance. The duty nurse chose a convenient time to inform the patients about the matters needing attention during discharge. The eligible participants who were randomly assigned to the intervention group received

discharge guidance, based on the theoretical framework of the Omaha System. Three days before discharge, the duty nurses clarified patients' problems at discharge. Then, they developed specific intervention strategies. After implementation of the interventions, the duty nurse assessed the problems every day until discharge and adjusted the intervention strategies according to any changes in the problems. Figure 1 shows the conceptual framework of the intervention program.

Data analysis

The statistical analysis was carried out by using SPSS (v. 17.0., SPSS, Chicago, IL, USA). Descriptive statistics were used to assess the demographic characteristics. An independent-sample *t*-test and ANOVA were used to determine the effects of the interventions. The statistical test was two-tailed and $P < 0.01$ was considered to be statistically significant.

RESULTS

During the study period, 150 inpatients in a cardiovascular ward were assessed for eligibility and none of them was excluded. Seventy-five patients were randomly assigned to the intervention group and 75 to the control group. Five participants who received interventional treatment in the intervention group and four in the control group failed to complete the study.

Comparison of the two groups at baseline

Table 1 shows the baseline demographic data. The two groups were well balanced and there was no notable difference, indicating that the randomization process was successful.

Effects of the discharge guidance

Table 2 shows that the scores for knowledge, behavior, status, and the total score of the outcome measures were significantly different between the groups at the three time points. Table 3 shows that all the scores of the outcome measures were significantly different between the groups by pair-wise comparison between the different time points. The scores for knowledge, behavior, status, and the total score of the outcome measures also increased gradually as time went on after admission within both the intervention group and the control group.

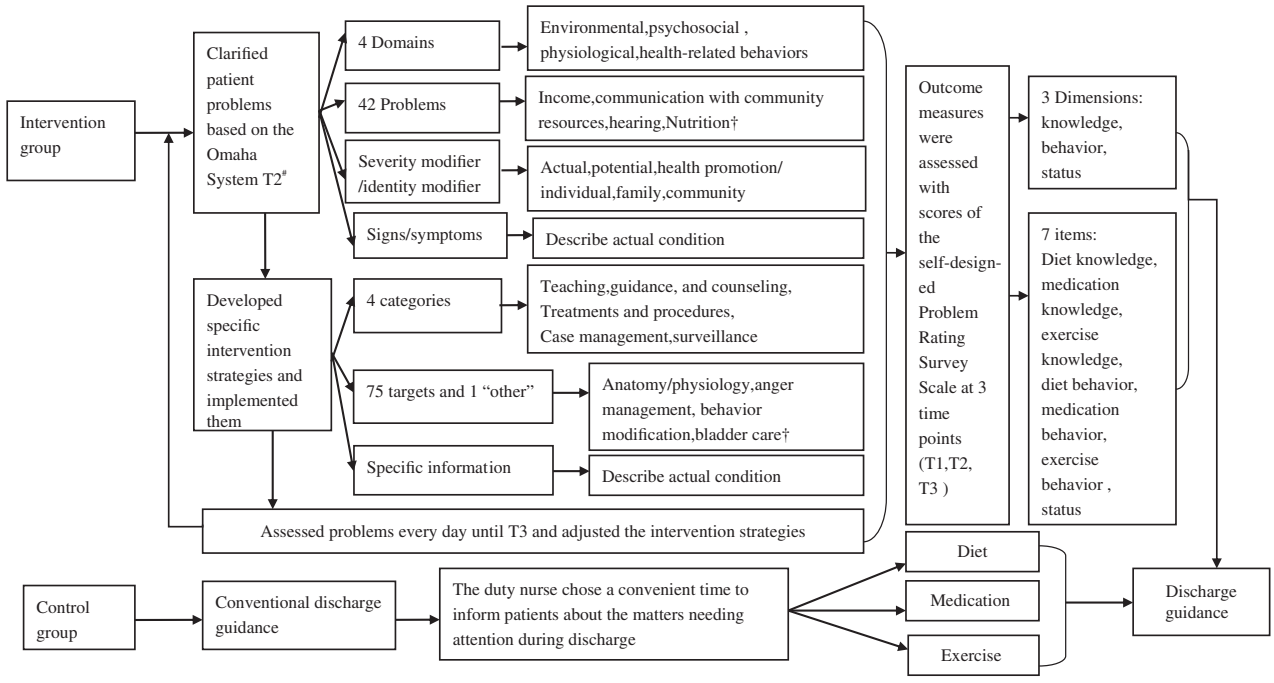

Figure 1 Conceptual framework of the intervention program. †For more details of the Omaha System, please refer to www.omahasystem.org. T1, day of admission; T2, 3 days before discharge; T3, day of discharge.

Table 1 Baseline demographic characteristics by group (n = 141)

Demographic characteristics	Intervention group (n = 70) N (%)	Control group (n = 71) N (%)	X^2	P
Sex				
Male	38 (54.3)	37 (52.1)	0.07	0.796
Female	32 (45.7)	34 (47.9)		
Age (years)				
18–44	5 (7.1)	9 (12.7)	2.48	0.290
45–64	46 (65.7)	38 (53.5)		
≥65	19 (27.1)	24 (33.8)		
Education level				
Elementary school	7 (10.0)	7 (9.9)	0.44	0.931
Middle school	43 (61.4)	47 (66.2)		
Trade school	2 (2.9)	2 (2.8)		
University degree	18 (25.7)	15 (21.1)		

Table 2 Comparison of the scores for the outcome measures within the two treatment groups at three time points

Scores for the outcome measures	T1 N	T1 Mean (SD)	T2 Mean (SD)	T3 Mean (SD)	Within-group F	Within-group P
Knowledge						
Intervention group	70	1.37 (0.45)	2.70 (0.67)	4.10 (0.67)	356.11	<0.001
Control group	71	1.34 (0.46)	2.46 (0.63)	3.18 (0.89)	132.76	<0.001
Behavior						
Intervention group	70	1.33 (0.51)	2.94 (0.67)	4.48 (0.56)	510.20	<0.001
Control group	71	1.37 (0.51)	2.86 (0.98)	3.35 (0.85)	117.33	<0.001
Status						
Intervention group	70	3.00 (0.96)	4.07 (0.52)	4.81 (0.39)	129.30	<0.001
Control group	71	3.24 (0.78)	4.10 (0.61)	4.70 (0.57)	87.77	<0.001
Total						
Intervention group	70	5.70 (1.45)	9.72 (1.51)	13.40 (1.26)	521.83	<0.001
Control group	71	5.94 (1.29)	9.41 (1.63)	11.23 (1.83)	200.25	<0.001

SD, standard deviation.

Table 3 Pair-wise comparisonof the scores for the outcome measures within the two treatment groups at three time points

Scores for the outcome measures	T1 *vs* T2 N	T1 *vs* T2 t	T1 *vs* T2 P	T1 *vs* T3 t	T1 *vs* T3 P	T2 *vs* T3 t	T2 *vs* T3 P
Knowledge							
Intervention group	70	13.79	<0.001	28.39	<0.001	12.34	<0.001
Control group	71	12.13	<0.001	15.59	<0.001	5.66	<0.001
Behavior							
Intervention group	70	16.00	<0.001	34.72	<0.001	14.80	<0.001
Control group	71	11.41	<0.001	16.89	<0.001	3.18	0.002
Status							
Intervention group	70	8.19	<0.001	14.60	<0.001	9.55	<0.001
Control group	71	7.28	<0.001	12.74	<0.001	6.09	<0.001
Total							
Intervention group	70	16.07	<0.001	33.51	<0.001	15.67	<0.001
Control group	71	14.05	<0.001	19.88	<0.001	6.26	<0.001

Effects of the discharge guidance based on the theoretical framework of the Omaha System

Table 4 shows that the increase in scores in knowledge, behavior, status, and the total score of the outcome measures were not significantly different between the groups from T1 to T2. But, there were significant differences between the groups regarding an increase in the scores in knowledge, behavior, and the total score of the outcome measures from T2 to T3 and the increase in scores in the intervention group was higher than that in the control group from T2 to T3.

DISCUSSION

The Omaha System is a standardized tool and consists of the problem classification scheme, intervention scheme, and Problem Rating Scale for Outcomes. This study's results suggest that moving it to the field of discharge guidance from the traditional field is effective in improving health education for patients with angina without interventional treatment.

A challenging time for the patients with angina without interventional treatment is the period after discharge. As they worry about deterioration and recurrence of the disease, they need self-management and transitional nursing to help them to cope with the health problems. Patient-oriented educational programs improve disease knowledge and physical activity (Meng *et al.*, 2014). In the present study, the scores for the outcome measures increased gradually after admission for both groups. The study's results suggested that timely treatment and nursing after admission were effective in improving the outcome measures for the patients.

Table 4 Comparison of the scores for the improved outcome measures by group at three time points

Scores for the outcome measures	T2–T1		T3–T2
	N	Mean (SD)	Mean (SD)
Knowledge			
Intervention group	70	1.340 (0.66)	1.400 (0.61)
Control group	71	1.390 (1.05)	0.460 (0.41)
t		0.350	10.720
P		0.727	<0.001
Behavior			
Intervention group	70	1.610 (0.64)	1.540 (0.60)
Control group	71	1.490 (1.01)	0.490 (0.39)
t		0.820	12.360
P		0.414	<0.001
Status			
Intervention group	70	1.070 (0.84)	0.740 (0.50)
Control group	71	0.860 (0.70)	0.610 (0.55)
t		1.630	1.550
P		0.106	0.123
Total			
Intervention group	70	4.020 (1.65)	3.680 (1.26)
Control group	71	3.740 (2.06)	1.550 (0.86)
t		0.880	11.700
P		0.380	<0.001

SD, standard deviation.

In the present study, the scores for improved knowledge, behavior, and the total score, but not status, in the intervention group were higher than those of the control group from T2 to T3.

The intervention group had a mean increase of 1.40 ± 0.61 in the knowledge scores from T2 to T3, which was significantly different to the control group. It has been shown that improvement of health educational strategies by nurses can increase the knowledge of heart disease among hospitalized patients (Dilles *et al.*, 2011). In the present study, the discharge guidance of the intervention group focused on the lack of knowledge and gave targeted supplementation and explanation; thus, the patients' understanding was deepened. Effective assessment and information management can help patients with heart disease to understand the importance of key lifestyle changes (Broadbent, Leggat, McLachlan, & Kerr, 2013). Patients' health knowledge is one of the bases of compliance (Menarello *et al.*, 2009). Discharge guidance that was based on the theoretical framework of the Omaha System was closer to the needs of the patients and the key point of the guidance was more outstanding. Discharge guidance could enhance the health knowledge of disease and improve compliance with nursing interventions of the patients.

The intervention group had a mean increase of 1.54 ± 0.60 in their behavior scores from T2 to T3, which was significantly different to the control group. The gap between performance in accomplishing self-care behavior by patients with heart disease might be a factor in clinical decompensation and the unplanned use of health care (Albert, 2013). Behavioral change is an important mechanism for improving the health of patients with heart disease (Hill *et al.*, 2013). In the present study, the discharge guidance of the intervention group focused on the existing problems of the behavior and proposed targeted strategies for their resolution. The increase in knowledge could improve the compliance of the intervention group and transform their health behavior. The discharge guidance based on the theoretical framework of the Omaha System was closer to the needs of the patients. The behavior improved

obviously in coordination with an improvement of health knowledge and compliance with nursing interventions.

The intervention group had a mean increase of 0.74 ± 0.50 for status from T2 to T3, which was not significantly different to the control group. Research has shown that nurse-led patient health education is the most effective intervention to improve the outcomes of patients with heart disease (Kinugasa *et al.*, 2014). Patient outcomes have shown significant improvement in relationship to knowledge, behavior, and status (Thompson, Monsen, Wanamaker, Augustyniak, & Thompson, 2012). This is not completely consistent with the present results. In this study, there was no alleviation of status. One possible reason was that disease progression and treatment effects also had an important influence. Another possible reason was that the discharge guidance needed more time to improve status.

The intervention group had a mean increase of 3.68 ± 1.26 on the total score of outcome measures from T2 to T3, which was significantly different to the control group. Discharge guidance that is based on the Omaha System is conducive to the determination of patients' nursing care needs and the level of care that is required. Patients experience the understanding and attention of nurses in the process of receiving discharge guidance, which can improve their trust in the nurses and enhance the effect of discharge guidance further.

The Omaha System can generate reliable, valid, and useful data. Researchers can use the Omaha System's clinical data to learn more about effective health promotion from an ecological theoretical perspective (Olsen, Baisch, & Monsen, 2017). Research has shown the value of using the Omaha System in the Outcome-Based Quality Improvement process (Westra, Solomon, & Ashley, 2006). Providing transitional nursing for patients with angina without interventional treatment was effective in line with the needs of angina prevention and control. Implementing discharge guidance based on the Omaha System was valid.

Implications for clinical practice

Discharge guidance is a key part of health education and the exploration demand of delivering effective discharge guidance to patients with angina without interventional treatment is emphasized.The results of this study might contribute to the further dissemination of the Omaha System and broaden the evidence base for the effective implementation of strategies for discharge guidance.

CONCLUSION

Discharge guidance based on the theoretical framework of the Omaha System,from 3 days before discharge, enhances the knowledge and behavior of patients with angina without interventional treatment on the day of discharge.

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DISCLOSURE

The author declares no conflict of interest.

AUTHOR CONTRIBUTIONS

S. Q. X. and L. F. conceived the study; S. Q. X. curated the data and and carried out the formal analysis; S. Q. X. and H. D. were responsible for the investigation; S. Q. X. and L. F. carried out the methods; L. F. was in charge of the project's administration and supervision; S. Q. X. and L. F. wrote the original draft; L. F., S. Q. X., and H. D were involved in the writing, review, and editing of the final draft of the manuscript.

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