Songklanakarin J. Sci. Technol.
39 (3), 341-346, May - Jun. 2017

http://www.sjst.psu.ac.th

Original Article

The effects of a community-based discharge-planning model for continuing pressure ulcer care on wound healing rates, nutritional status, and infection rates of elderly patients in Thailand

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Received: 7 March 2016; Revised: 29 May 2016; Accepted: 5 June 2016

Abstract

This quasi-experimental research design study aimed to determine the effects of a community-based discharge-planning model for continuing pressure ulcer care on the nutritional status, wound-healing, and infection rates in one hundred elderly patients at a tertiary hospital in Thailand. The patients were simple randomized into two groups; namely, the control group receiving regular care and the experimental group using the model for continuing pressure ulcer care. Data from a personal information record, a wound-healing rate evaluation form, and a record of ulcer cultures and blood albumin levels were analyzed using descriptive statistics, t-test and chi-square test. The results showed that the wound-healing rate and blood albumin of the experimental group were significantly higher compared to the control group ($p < 0.01$). Also, the ulcer infection rates were significantly different between the two groups ($p<0.05$). The evidence suggests that the community-based discharge-planning model for continuing pressure ulcer care is effective and efficient in improving nutritional status, healing ulcers, and reducing ulcer infections.

Keywords: pressure ulcer, wound-healing, nutritional status, infection, elderly patients

1. Background

Pressure ulcers are a common condition among elderly in acute and chronic care facilities and impose a significant burden on patients, their relatives, and caregivers especially in the community. Pressure ulcers have been described as one of the most costly and physically-debilitating complications that affect the quality of life of the elderly (Hisashage & Ohura, 2012). Moreover, pressure ulcers are associated with increased rates of morbidity and mortality (Wang *et al.*, 2014). Infectious agents may enter into the bloodstream causing complications (Baumgarten *et al.*, 2012), hence increased length of hospital stay (Gorecki *et al.*, 2009), higher medical costs (Wang *et al.*, 2014), and a four-fold increase in the risk of death (Barker *et al.*, 2012).

Pressure ulcers occur due to pressure or pressure in combination with shear over a bony prominence that results in skin injury and injury to the underlying tissues (National Pressure Ulcer Advisory Panel [NPUAP], 2007). Elderly patients with pressure ulcers usually have a decreased appetite and sense of taste that may cause malnutrition and increase the risk of developing pressure ulcers by 17% (Shpata *et al.*, 2015; Suttipong *et al.*, 2006). The lack of the protein albumin causes the cells to swell and impairs the exchange of nutrients, oxygen, and waste products, resulting in the loss of cell integrity and making wounds become more severe pressure ulcers (Hisashige & Ohura, 2012; NPUAP, 2007).

For the aforementioned reasons, the author saw the need for a community-based discharge-planning model for continuing ulcer pressure care in order to promote the healing

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of pressure ulcers, reduce infection rates, and improve the nutritional status among elderly patients in the rural community in Thailand. This model may be used as a guideline for the development of a patient-educating system as well as new approaches in caring for pressure ulcers that will improve the quality of the life of elderly patients.

This conceptual framework provides an efficient clinical referral path to wound healing that involve wound management on the basis of providing care for pressure ulcer patients with poor circulation, malnutrition, improper off-loading, and immune-compromising conditions. The goals of the community-based discharge-planning model are to treat chronic wounds through the stages of healing, to reduce infections or complications, and to prevent future chronic wounds as well as to restore the functional activities of daily life. These goals correspond to the principal guideline for pressure ulcer management reported in many articles, that the basic knowledge of pressure ulcers, the method to prepare supplies and steps of wounds cleansing, nutrition support, technique and interval of repositioning, and daily living activities should be considered (Mamom *et al.*, 2013).

2. Research Objectives

1) To determine the difference in average wound-healing rates between the group that used the discharge-planning model for continuing pressure ulcer care and the group receiving regular treatment

2) To determine the difference in the rates of infection between the two groups

3) To determine the difference in the nutritional status between the two groups

3. Research Design

This research was designed as an experiment to study the impact of using the discharge-planning model for continuing pressure ulcer care on the wound-healing rates, infection rates, and nutritional status among elderly patients from November 2013 to August 2014.

Inclusion criteria: patients aged 60 years and above that were diagnosed as having pressure ulcers of any grade and whose relatives were allowed by physicians to take care of the patients at home, those that could communicate and understand the Thai language, and those willing to participate in the research.

In order to define the sample size of the group by G*Power 3.1.9, an effect size of 0.75 (Mamom *et al.*, 2013), a test power of 0.95, and an alpha value of 0.05 were set (Faul *et al.*, 2007). One hundred patients were divided into experimental and control groups, each of which comprised 50 patients. Matched pairing was performed using the criteria of gender, age with less than a five year difference, same ulcer grade, an ulcer score with less than a two point difference, and albumin level with not greater than 0.2 mg/dl difference. The research instruments comprised 2 parts as follows.

Part 1: Information-gathering instruments, comprising:

1.1 Personal information-recording form that included gender, age, marital status, household income, and pressure ulcer grade and duration

1.2 Pressure ulcer status tool: PUSH (NPUAP, 1998; Stotts *et al.*, 2001) to evaluate the healing. This tool comprises the following three sub-scores.

1) Wound size was defined as the multiplication of the widest and longest lengths in centimetres (cm^2). The size was scored on a 10-score scale: < 0.3 cm^2 (score of 1), 0.3-0.6 cm^2 (score of 2), 0.7-1.0 cm^2 (score of 3), 1.1-2.0 cm^2 (score of 4), 2.1-3.0 cm^2 (score of 5), 3.1-4.0 cm^2 (score of 6), 4.1-8.0 cm^2 (score of 7), 8.1.-21.0 cm^2 (score of 8), 21.1-24.0 cm^2 (score of 9) and > 24 cm^2 (score of 10).

2) Exudates were classified as four sub-scores: no exudates at all (score of 0), < 25% of the ulcer surface (score of 1), 26-50% of ulcer surface (score of 2) and > 50% of ulcer surface (score of 3).

3) Tissue type was classified according to five sub-scores: healed (score of 0), with epithelial tissue (score of 1), with granulation tissue (score of 2), with slough (score of 3), and necrotic/eschar (score of 4) during two wound-healing evaluations on days 1 and 14.

The total score is the sum of scores of three items mentioned above. The scale for each item begins with zero, thus the total score of PUSH ranges from zero to seventeen. A total score of zero represents a healed wound whereas a total score of seventeen reveals no progression of wound healing.

1.3 Swab cultures from the ulcer surface for two evaluations on days 1 and 14

1.4 Blood drawing for blood albumin levels at two time points; namely days 1 and 14

Part 2: The tool used to conduct the research was the discharge-planning model for continuing pressure ulcer care. This tool comprised the following: 1) Health education on the definition, etiology, and pathogenesis of the ulcers using the brochure, 2) Demonstration on cleaning wounds, 3) Calculation of the daily nutrient requirements, 4) Food preparation indicated for patients, 5) Demonstration on skin care, body flipping, moving the patient, and evaluating the ulcer, and 6) Follow-up phone call to patients and family members to ask above their compliance to the manual, and to discuss the barriers encountered at home

3.1 Instrument evaluation

The content validity of the instrument and the manual for caring for patients with pressure ulcers was assessed by a physician, two Advanced Practice Nurses. It was used in a trial with 10 patients that had characteristics similar to those of the patients in the main study. The internal consistency reliability of the PUSH Tool Version 3 evaluation form in the trial with 10 patients revealed a Cronbach's alpha of 0.91 (Cronbach, 1951).

3.2 Ethical considerations

The research was approved by the Research Ethics Committee of Thammasat University with approval number 067/2556.

3.3 Information gathering

1. The experimental group received the knowledge provided by the discharge-planning model for continuing pressure ulcer on the first day of the study. Subsequently, the researchers assessed the ulcer healing rate using PUSH Tool Version 3 (NPUAP, 1998) cited in Pumraya (2009), ulcer infection using the swab culture technique, and nutritional status by testing 5 ml of blood for blood albumin level. After a week, a follow-up call was made to ensure that the patients and family members understood and complied with the provided manual on ulcer care. During the second week, the researcher assessed the ulcer healing rate, ulcer infection, and blood albumin.

2. The control group received education as per the usual pattern of nursing activities. All of the subsequent research assessments, including those during the first and second weeks, were the same as those used with the experimental group.

3.4 Data analysis

This study used SPSS version 15 to analyse the data according to 4 parts. In the first part, personal information was analysed using descriptive statistics, comprising of frequency, percentages, means, and standard deviations. In the second part, a comparison of the average wound-healing rates between the experimental and control groups was made using t-test statistics. For the third part, a comparison of the rates of infection between the two groups was made using chi-square statistics. The last part was a comparison of the nutritional status based on the average levels of blood albumin between the two groups using a t-test.

4. Results

For the sample group of 100 patients in total, the average age was 60.04 years (SD 5.91) and most of them were female (n=57, 57%). Both the experimental and control groups had not different demographic data ($p>0.05$).

A comparison of the mean of wound-healing rates revealed that the rate of the experimental group was significantly higher than that of the control group ($p<0.01$), as shown in Table 1.

Further, a comparison of the rates of infection revealed that the rates of ulcer infection were significantly different ($\chi^2 = 4.00$, $df = 1$, $p = 0.04$), as shown in Table 2.

The comparison of the nutritional status revealed that the average blood albumin level of the experimental group was significantly higher than that of the control group ($p< 0.05$), as shown in Table 3.

5. Discussion

In this study, most of the subjects were female (58.3%). The average age of 60.4 years, which was consistent with the studies of Mamom (2013), Punpho and Mamom (2014), and McGinnis (2014), which revealed that pressure ulcer

Table 1. Comparison of wound-healing scores using the mean of PUSH scores (0-17) between the experimental and the control groups, independent t-test analysis.

Group	N	Mean Score	S.D.	df	t	p value
Control	50	10.34	3.18	98	-3.453	0.001*
Experimental	50	8.06	3.41			

* $p < 0.01$.

Table 2. Comparison of the incidence of infection between the experimental and the control groups, chi-square analysis.

Infectious status	Experimental group (N)	Control group (N)	χ^2	df	p value
Not infected	48	42	4.00	1	0.04*
Infected	2	8			
Total	50	50			

* $p < 0.05$.

Table 3. Comparison of nutritional status using mean serum albumin levels (g/dL) between the experimental and the control groups, using independent t-test analysis.

Group	N	Mean Serum albumin	S.D.	df	t	p value
Control	50	2.48	0.50	98	2.078	.04*
Experimental	50	2.70	0.56			

* $p < 0.05$.

patients had an average age of 64.88 years (SD 10.76), 61.65 years (SD 7.65), and 77.8 years, respectively. The elderly are usually affected by pressure ulcers because of decreased collagen production in the dermis and reduced mobility, resulting in prolonged pressure leading to pressure ulcers. Additionally, this group of people often have underlying disease symptoms or abnormalities, such as nervous system malfunctions or unconsciousness that reduces blood circulation, thus impairing sufficient transport of nutrients and oxygen to the cells. Moreover, the elderly patients that fail to control their urination and defecation have moist skin that cannot withstand pressure or friction, rendering them more prone to pressure ulcers than other age groups.

The use of the discharge-planning model for continuing pressure ulcer care in promoting the ulcer healing, nutrition status, and reducing rates of infection among elderly patients consisted of two major activities as follows.

Activity 1: preparation of the patients and their families prior to discharge. The intervention given comprised knowledge of pressure ulcers in accordance with studies by Mamom (2013) and Punpho and Mamom (2012), who found that the preparation of patients prior to discharge required knowledge of the meaning, pathology, pathogenesis, and grades of the ulcers. This knowledge helps patients and their families/caregivers to be aware of and to understand the importance of the care of patients with pressure ulcers. The first component of the knowledge provided was the preparation of clean supplies to prevent wound infection (Mamom *et al.*, 2013; Wound, Ostomy and Continence Nurses Society [WOCN], 2012). The second component of knowledge involved proper nutrition to reduce the occurrence of pressure ulcers (Suttipong *et al.*, 2006). Elderly people with severe malnutrition have been found to be 2.8 times more at risk of pressure ulcers. Additionally, the elderly tend to get less quantity of nutrients because of their impaired sense of taste, which leads to a decrease in appetite and oral and teeth problems, causing protein deficiencies. Protein normally increases the oncostatic pressure; without protein, plasma will leak through blood vessel walls into the intercellular space, and the water loss from the dermis will be more pronounced, resulting in swelling of the skin. The swelling, in turn, destroys intercellular adhesion and increases the chance of pressure ulcers. Teaching the relatives/caregivers how to calculate the daily quantity of essential nutrients will enable them to prepare adequate food and improve the nutritional status of the patients consequently (Dorner *et al.*, 2009). The third component of the knowledge involved the method of repositioning patients to reduce pressure, and the occurrence of shearing and friction. Studies have shown that friction and shearing forces are significantly related and can predict the occurrence of pressure ulcers (Suttipong *et al.*, 2006). It has been found that the elderly create shearing and friction while moving and have a 11.2-fold increase in the chance of developing pressure ulcers. There is limited evidence that supports the effect of position and frequency of repositioning in reducing pressure ulcers; however, it is widely used in practice because it provides a clear logical reason to reduce friction and shearing of the skin. Hence, repositioning is recommended and is relevant in pressure ulcer prevention and treatment (Moore & Cowman, 2012). The last component of the knowledge was skin care in order to ensure that the moisture of the skin was retained while avoiding clamminess from sweat, urine, and feces that cause skin maceration, leading to pressure ulcers. The elderly with clammy skin are 2.2 times more likely to develop pressure ulcers (Suttipong *et al.*, 2006) and ulcer infections (Barker *et al.*, 2012).

Activity 2 comprised knowledge review/enhancement by weekly follow-up phone calls to provide an opportunity for patients and their relatives to ask questions related to the barriers encountered at home, dealing with and solving problems in a given situation, as well as how to contact the healthcare team for assistance (Mamom *et al.*, 2013).

This study provides insight into the extent of the pressure ulcer preventive practices used by nurses. The results may serve as a basis for developing an effective strategy to improve nursing practice in this area and to promote evidence-based practice. The model was accomplished through various forms of educational activities, such as individual lectures, and practice demonstrations to ensure that patients would be able to perform pressure ulcer care properly, and the monitoring of symptoms. These activities give the patients and their family caregiver's knowledge that they can be applied to modify their behaviours regarding patient care, and in this way, the caregivers will feel that they are part of the health team in achieving the desired results. Nurses, therefore, have an important role in assessing the knowledge of patients and their relatives regarding pressure

ulcers and in providing correct information about pressure ulcer care—from admission to discharge. In addition, it is important that evaluation be done on the existing beliefs and practices of the caregivers before commencing education in order to correct any misconceptions they may have and so that they can understand the need for pressure ulcer care.

6. Suggestions

These research results can be used as a basis to educate patients and their relatives or caregivers in the prevention and treatment of pressure ulcers, from admission to discharge. Additionally, they can serve as a guide in the preparation of manuals for the care of patients with pressure ulcers in the home setting. Furthermore, collaboration between the hospital and community in the provincial and regional levels must be instituted for pressure ulcer prevention and treatment.

Acknowledgements

The author is thankful to Thammasat University, the Faculty of Nursing, for funding this research project and to the Research Center for Nursing and Behavioral Science (RCNBS) for their assistance in the preparation of this paper.

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