

Case Study: Evidence-Based Interventions Enhancing Diabetic Foot Care Behaviors among Hospitalized DM Patients

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Background: Improving diabetic patients' foot care behaviors is one of the most effective strategies in minimizing diabetic foot ulceration and its further negative impacts, either in diabetic hospitalized patients or outpatients.

Purpose: To describe foot care knowledge and behaviors among hospitalized diabetic patients, to apply selected foot care knowledge and behaviors improvement evidence, and to evaluate its effectiveness.

Method: Four diabetic patients who were under our care for at least three days and could communicate in Thai language were selected from a surgical ward in a university hospital. The authors applied educational program based on patients' learning needs, provided diabetic foot care leaflet, and assisted patients to set their goal and action plans. In the third day of treatment, we evaluated patients' foot care knowledge and their goal and action plan statements in improving foot care behaviors.

Result: Based on the data collected among four hospitalized diabetic patients, it was shown that all patients needed foot care behaviors improvement and the educational program that combined with goal setting and action plans improved hospitalized patients' foot care knowledge and their perceived foot care behaviors. This combination method was easy, safe, and seemed feasibly applicable for hospitalized diabetic patients

Conclusion: The results of this study provide valuable information for improvement of hospitalized diabetic patients' foot care knowledge and behaviors. The authors recommend nurses to use this evidence-based practice to contribute in improving the quality of diabetic care.

Keywords: Intervention, diabetic foot care, hospitalized diabetic patients

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Introduction

Diabetic foot ulcer (DFU) is one of the most serious diabetic complications. It affects almost 15% to 25% of diabetic patient at some point during their life (Singh, Amstrong, & Lipsky, 2005). Diabetic foot ulcer treatment is challenging, costly, time consuming (Edmonds, 2006; Jeffcoate & Hardig 2003; Ragnarson-Tennvall, & Apelqvist, 2004), high recurrent (Ghanassia et al., 2008), easily infected and often requires some types of foot amputation (Canadian Diabetes Association [CDA], 2005). Furthermore, the evidences noted that diabetes related foot amputation caused serious problems, such as disability, depression, financial burdens, poor quality of life, and high mortality (Abdelgadir, Shebeika, Eltom, Berne, & Wikblad, 2008; Ragnarson, Tennvall, & Apelqvist, 2004; Stockl, Vanderplas, Tafesse, & Chang, 2004). Thus, DFU prevention is very important.

Pathologically, the peripheral neuropathy (PN) that eventually causes loss of protective sensation, foot deformity, dry skin, crackling or fissure easily results in foot ulceration. Moreover, some of the patients' daily activities, such as walking bare foot or trimming nails are potential causes of foot ulcer. These situations underline that daily foot inspection to early detect foot abnormalities is very important. It was noted that patients who performed proper foot care had significantly lower risk of foot ulceration than those who did not (Calle-Pascual et al., 2001; Jayaprakash, Bhansali, Dutta, & Anantharaman, 2009). Unfortunately, previous researches showed that many diabetic patients did not perform it properly (Jayaprakash et al., 2009; Martin & Deepak, 2006; Johnston et al., 2006).

The evidences and practice guidelines concerning this phenomenon suggested that educational program was the recommended strategy to improve patients' foot care knowledge and behaviors (ADA, 2004; CDA, 2008; Corbett, 2003, Lincoln, Radford, Game, & Jeffcoate, 2008; McMurray, Johnson, Davis, & McDougall, 2002; Registered Nurses' Association of Ontario [RNAO], 2007; Valk, Kriegsman, & Assendelft, 2005). However, the traditional approach which placed patients as passive participants was reported no longer effectively improved patients' adherence and behaviors (Funnell & Anderson, 2000). Conversely, previous studies showed that self management (SM) approach which positioned patients as active participants had better outcomes on patients' behaviors, self-efficacy, quality of life, and cost effectiveness (Lorig & Holman, 2003; Lorig, Hurwicz, Sobel, Hobbs, & Ritter, 2005; Warsi, Wang, LaValley, Avorn, & Solomon, 2004). A meta-analysis study conducted by Ellis and colleagues (2004) found several strategies to implement self-management program including didactic strategy, goal setting and action planning strategy,

situational problem solving, and cognitive reframing. Among those strategies, goal setting and action planning is one of the commonly use strategies. In this strategy, patients were individually facilitated to set their own goal(s), develop action plan(s), and implement those plans effectively through some follow up programs (DeWalt et al. 2009; Handley et al., 2006).

As integral part of healthcare service, nurses have important roles and responsibilities to improve diabetic patients' foot care knowledge and behaviors by applying existing empirical evidences. Unfortunately, none of the above evidences was applied in the hospitalized patients. Principally, hospitalized diabetic patients have the same needs to improve their foot care knowledge and behaviors in order to prevent or minimize diabetic foot complications. However, because some of them did not have actual foot ulcer or complain about any symptoms related foot problems, they might not be properly assessed for diabetic foot care knowledge and actual foot care behaviors. Consequently, nurses do not include these problems in the nursing care plan and finally these needs are inadequately treated. In this article, the authors would like to present the evidence-based interventions that can be used in the clinical settings to improve hospitalized diabetic patients' foot care knowledge and behaviors in order to prevent DFU and foot complications. This article demonstrates how these evidence-based interventions were applied in 4 case studies.

Objectives

Objectives of this study were to:

1. Describe foot care knowledge among hospitalized DM patients
2. Describe foot care behaviors among hospitalized DM patients
3. Examine factors contributing to foot care behaviors and foot ulcer development among hospitalized DM patients
4. Apply and evaluate evidence-based nursing intervention to improve hospitalized patients' foot care knowledge and behaviors, reduce contributing factors, and prevent or improve foot ulcer among hospitalized DM patients

Method

Setting and Sample

This study was part of the Advance Nursing Practicum in Adult and Elderly with Acute and Chronic Illness course that conducted in a Male Surgical Ward of a university

hospital in southern Thailand. Most of hospitalized diabetic patients in this ward were men, adult and/or elderly, and had health problem or body system alteration requiring surgical treatment. In addition, many of them were diagnosed with various underlying (chronic) diseases, such as hypertension, DM, dyslipidemia, renal failure, heart diseases, or combination of these underlying diseases. The criteria of selecting participants for this study are as follows: (1) known DM case; (2) the patient has a potential to be under the authors' care for at least 3 days; (3) the patient is able to communicate in Thai language.

Data Collection Tool

Demographic Data Collection Tool. The demographic questionnaire was developed to collect data regarding age, sex, religion, address, marital status, educational level, diabetic foot care education experiences, check-up profile, recent blood glucose level, actual complication, foot condition, and DM duration. These data were inquired from direct interview, foot assessment, medical record, and/or interviewing patient's family members.

Foot Care Knowledge Questionnaire. The diabetic foot care knowledge was assessed by using the questionnaire which was developed for using in this study. The questionnaire consists of 12 true-false questions. These questions are related to the proper diabetic foot care behaviors including diabetic foot care (DFC) frequency, the purpose and significance of proper DFC, foot parts checking, sensation and vascular status examination, the importance of drying foot after washing, toenail trimming, footwear, and the initial treatment after blister/wound development.

Foot Care Behaviors Questionnaire. In this present study, we used the 29-item Nottingham Assessment of Functional Foot-care Questionnaire (NAFF) that was proved to be valid and reliable to assess diabetic foot care behaviors (Lincoln, Ince, Smith, and Readford, 2007). However, it was developed and commonly used in European countries, thus some points were considered unfit when using with patients from Asian culture. Therefore, we modified some items to enhance its cultural sensitivity. For this purpose, firstly, the second author reviewed and discussed with Thai master nursing students to verify items relevant with Thai people. Next, based on the information obtained, we retained most items and we modified three items, added one foot inspection item, added one item, attend in the regular foot examination, added one item and picture of toenail trimming, grouped five footwear-type

items into one item, grouped two checking footwear items into one items, discarded five items (one item related to stocking type, three items related to European habit, and one item related to fitting shoes). This process resulted in the final twenty-two items of the modified NAFF. Patients were asked to rate on Likert scale ranging from 0 – 3 to indicate the frequency of occurrence of the behaviors. The positive statements ranged from ‘Never’ (0), ‘Rarely’ (1), ‘Sometimes’ (2) or ‘Always’ (3), and conversely for the negative ones. The higher total score and subscale score indicated better foot care behaviors.

Selecting the Evidence-Based Intervention for Enhancing Patients’ Foot Care Behaviors

In this present study, the goal setting and action planning protocol from DeWalt and colleagues (2009) was adjusted and applied to improve diabetic foot care knowledge and behaviors of four hospitalized diabetic patients. Initially, we assessed the patients and their foot care knowledge. Based on the assessment findings, we provided individual (face-to-face) education related to proper diabetic foot care and clarified participants’ understanding on the information given. During this process, we gave each patient proper foot care booklet to use as an additional guide. Each patient then was facilitated to set his/her own goal(s) and action plans in order to improve his/her foot care behaviors. It was followed by discussion to identify the possible difficulties during action plans implementation and to further identify the effective and applicable solutions.

Furthermore, in each step of intervention, we involved patient’s family members and asked them to act as patient’s reminder, support provider, assistant, or other roles to facilitate the effectiveness of action plans implementation. Finally, the authors evaluated each patient’s understanding regarding proper foot care, patient goal(s), and their action plan(s) on the third day of treatment and provided follow-up phone call one week after they discharged. During the phone call session, the authors discussed with the patients regarding patients’ achievement and action plans implementation and could identify the difficulties they found during implementation. Then, the authors provided brief consultation to facilitate each patient to find possible solutions or created further goal and action plans.

Results

Since all subjects experienced other actual problems that might/might not directly relate to the foot care behaviors and diabetes mellitus, the authors integrated treatment protocol developed by the authors along with other interventions to solve/minimize identified

problems. In other words, the diabetic foot care knowledge and behaviors improvement interventions were given incorporated with the patients' concerns, patients' actual condition, and other needed interventions. This was to ensure that holistic, patient-centered care was maintained.

The individualized educational program covered proper diabetic foot care behaviors, foot condition and foot care behaviors findings. Each subject received similar general proper foot care information, but they received different additional information depending on the finding of their knowledge, current foot condition, and foot care behaviors. The significance of proper diabetic foot care behaviors and its roles in preventing DFU/other diabetic foot complication and each foot care step were discussed comprehensively and presented to them in the booklet. We further clarified the subjects' and their family members' understanding on the information given. More detailed findings are presented as follows:

Demographic Data and General Clinical Information

Generally, patients were different in some characteristics including age, occupation, educational level, foot care education experience, and regular check up history (Table 1). Even though the major complaints of all subjects were not directly related to DM, all subjects already developed DM complication.

Table 1 *Demographic Data*

Profile items	Subject I	Subject II	Subject III	Subject IV
Age	70	51	53	71
Religion	Buddhism	Buddhism	Buddhism	Buddhism
Occupation	Farmer	Fisherman	Unidentified	Police
Marital status	Married	Married	Married	Married
Educational Level	Unidentified	Senior high school	Unidentified	University
Foot care education experience	(+)	(+)	(-)	(-)
Regular check up	(+)	(+)	(-)	(+)
Care giver	Wife & daughter	Wife	Wife & daughter	Wife
Uncontrolled DM	(+)	(-)	(+)	(-)
DM Complication	(-)	(+)	(+)	(+)
		(nephropathy, neuropathy, angiopathy, and hyperglycemia)	(neuropathy and nephropathy)	(neuropathy and angiopathy)
DM Duration	± 10 years	± 15 years	± 16 years	± 5 years
Co-morbid diseases	Rectal cancer, cataract left eye	Colon Cancer, IHD, Dyslipidemia, HNP post laminectomy	Bladder cancer, RF	CAD, Hypertension

Note: (+) the data was found; (-) the data was not found; IHD (Ischemic Heart Diseases); HNP (Hernia Nucleus Pulposus); CAD (Coronary Artery Disease)

Subject I: A 71-year-old man admitted with major complaint of confusion and inability to sleep well one week before admission. Generally, the patient looked confused, lack of eye contact but cooperative and had warm family support. The diagnosis on admission was delirium and uncontrolled blood glucose. In addition, he has a history of rectal cancer and undergoing the anterior-posterior resection (APR) with permanent colostomy four years ago. During assessment, the subject reported that he monthly checked up with his DM doctor and performed daily 30-minute exercise, but he said that sometimes he forgot to take the medication and did not strictly take DM diet. Based on the assessment findings on the 6th day of hospitalization, the authors identified the following nursing problems: inadequate rest and sleep, potential hyperglycemic/hypoglycemic complication, and risk for diabetic foot complication.

Subject II: A 51-year-old man was diagnosed of cancer of descending colon and sigmoid polyp with multiple underlying diseases, including hypertension, DM, ischemic heart diseases (IHD), dyslipidemia, renal insufficiency, and Herniated Nucleus Pulposus (HNP) undergoing laminectomy three years ago. The subject was very cooperative, talkative, open minded, had warm family support, and participated actively in the discussion session. He was a heavy smoker and had experienced repeated toenails ingrown. He reported that he regularly checked up with DM doctor, adhered to the medication regimen, and had received information about proper foot care and diabetic foot complications. Based on the assessment on the fourth day of post-operation, the authors identified five nursing problems including post-operative pain, skin integrity alteration (operative wound), potential ileus, risk for further complications (hyperglycemic, hypertension, and dyslipidemia) and risk for foot ulceration related to history of repeated ingrown toenails in both major toenails.

Subject III: A 53-year-old man was diagnosed of bladder cancer post cystectomy with neo-bladder two years ago and recently developed urinary tract infection (UTI), obstruction of neo-uretero-vesical junction, and suspected renal failure with BUN = 75.6 mg% and blood creatinine = 5.18 mg/dl. Additionally, his underlying disease was uncontrolled DM. His wife reported that he had never checked up for his DM, never exercised, regularly consumed coffee (1 glass/day) and did not adhere to the DM diet program. During assessment on the fifth day of hospitalization, he looked passive, reticent, apathy, and lack of eye contact with the authors. However, he was cooperative and had warm family support. The authors also identified that the subject had never attended in any foot care educational program before. Furthermore, the authors identified the following nursing problems: anxiety (concerning

kidney problem), risk for electrolyte imbalance, and risk for further DM complications (hypo/hyperglycemic, heart diseases, or retinopathy, and foot ulceration).

Subject IV: A 71-year-old man was admitted to the hospital for conducting a coronary arterial bypass graft surgery. In the admission report, he was diagnosed of coronary artery disease (CAD) with underlying diseases of hypertension, DM type II for five years, and ischemic heart diseases (IHD). He was cooperative and had a warm family support. In addition, he had smoking history of 10 pieces/day but already stopped for more than twenty years. He reported that he regularly exercised by riding bicycle 2-3 times/week and monthly visited his DM doctor for general check up, but he had never attended in the foot care educational program. The following nursing problems were identified: dyspnea, skin integrity alteration, risk for diabetic foot complication, post operative pain.

Patients' Foot Care Knowledge

Initially no subject answered all questions correctly (Table 2). In addition, the highest score was found in subject II (10) and the lowest score was found in subject III (6). Furthermore, all subjects answered incorrectly on question 1 that asked about frequency of diabetic foot care and question 8 that asked about being barefoot in the house. The post-test result showed that all subjects had improved their foot care knowledge. However, Subject I still answered question 8 incorrectly (wearing foot wear indoor and outdoor), while Subject IV did the same thing for question 4 (checking foot pulse).

Table 2 *Pre-test and Post-test Score of Knowledge of Diabetic Foot Care*

No.	Subject	Score	
		Pretest	Posttest
1.	Subject I	7	10
2.	Subject II	10	12
3.	Subject III	6	12
4.	Subject IV	7	11

Foot Condition

Assessment of foot condition include: general condition of foot (hygiene, dry skin, calluses, and actual ulceration), peripheral vascular diseases (PVDs) evidences, peripheral neuropathy (PN) and toenails conditions (see Table 3). The data demonstrated that all of them had never experienced foot ulceration, but they were at high risk for foot ulceration;

particularly subject II who had sign and symptom of neuropathy, PVDs, heavy smoking, and repeated ingrown history in his both major toenails.

Table 3 *Foot Conditions*

Assessment Items	Subject I	Subject II	Subject III	Subject IV
Actual foot ulcer/wound	(-)	(-)	(-)	(-)
History of foot ulcer	(-)	(-)	(-)	(-)
Dry skin/cracking/fissure	(+) Mild	(-)	(-)	(-)
Calluses	(+) Mild	(-)	(-)	(-)
Ingrown toenails	(-)	History (++)	(-)	(-)
Numbness	(-)	Right leg	Both (mild)	(-)
Right leg				
➤ Pulses of dorsalis pedis	(+)	(-)	(+)	(-)
➤ Pulses of Posterior Tibialis	(+)	(+)	(+)	(+)
Left leg				
➤ Pulses of dorsalis pedis	(+)	(+)	(+)	(+)
➤ Pulses of Posterior Tibialis	(+)	(+)	(+)	(+)

Note: (+) = found/experienced, (++) = experienced repeatedly, (-) = have not found/experienced.

Patients' Foot Care Behaviors

The findings (Table 4) of diabetic foot care behaviors assessed by using the modified NAFF. The data indicated that Subject II had the highest score (74.2%) and subject III had the lowest score (28.42%).

Table 4 *Subjects' Diabetic Foot Care Behaviors*

Item	Subject I	Subject II	Subject III	Subject IV
Foot examination (4 items)	8	10	2	3
Foot Hygiene (4 items)	6	8	7	8
Trimming Toenails (2 items)	6	6	4	6
Footwear (6 items)	7	12	9	11
Avoiding potential damaging foot (4 items)	2	7	4	3
Foot wound/ulcer management (2 items)	4	6	2	4
Total score*	33 (50%)	49 (74.2%)	28 (42%)	35 (53%)

*The full mark is 66. The higher score indicates the better DFC behavior

Goal Setting and Action Planning

Every subject set their goal(s) to improve diabetic foot behaviors incorporated with other goals to improve healthy behaviors including exercise, regular check up, diet program, and smoking cessation. In addition, most of the subjects reported that they did not find any possible barriers to implement those plans. The post-test session of this variable and patients' foot care behaviors were examined on the third day of treatment by clarifying with each subject concerning his foot care improvement planning after discharge. The findings suggested that every subject was able to restate the goal(s) and plan(s) that they set in the previous step and the entire family member stated that they would like to do their best to assist the patient in implementing the identified action plan to achieve the goal(s) (Table 5).

Phone Call Follow up

At one week after discharge, the authors followed up each patient by phone call, unfortunately, only two of the subjects were accessible (Subject I and III). Subject I reported that the action plans were performed and the foot care behaviors improvement goal was achieved (inspecting foot 3 times/week, wearing footwear outdoor, not wearing shoes without socks). In addition, the subject also successfully maintained his regular exercise and reduced juice and sweet snack consumption. Subject III's wife reported that her husband achieved the goals in almost every foot care behavior including inspecting foot 2 times/week, not being barefoot, and applying lotion. For other goals, he only accomplished partly. In the exercise goal, he only performed walking indoor, while in the DM diet goal, he was only able to reduce coffee consumption. In addition, his wife was also confused how to rearrange patients' diet regarding patients' renal diseases.

Discussion

The findings from the present study showed that no subject correctly answered every diabetic foot care knowledge question and all of them answered incorrectly on question 1 that asked about frequency of diabetic foot care and question 8 that asked about being barefoot in the house. When clarified, they said that they did not know that diabetic foot care should be performed daily and they informed that wearing footwear inside the house was an uncommon habit in their culture. This data indicates that DM patients need information support to improve their knowledge, which is very important because it is evident that lack of diabetic foot care knowledge was closely related to improper foot care behaviors (Chandalia, Singh,

Table 5

Goals Statement, Plans Statement, and Barriers Perceived

Subject	Goal Statement	Action Plans Statement	Perceived Difficulties
I	Goals for at least 1 week after discharge: <i>a. Foot care behavior goal:</i> performing proper diabetic foot care including foot inspection 3 times/week no bare foot inside/outside home, trimming toenails properly, wearing proper foot wear, avoid wearing shoes without socks, drying foot after taking a bath/shower. <i>b. Exercise behaviors goal:</i> maintaining his exercise behavior. <i>c. Diet behaviors goal:</i> improving diet behavior.	<ol style="list-style-type: none"> 1. Use the booklet provided as a guide to perform foot care, buy socks, buy proper foot wear (slipper for the indoor foot wear) 2. Inspect foot conditions and dry the foot after taking a bath/shower, wear proper footwear inside/outside, avoid wearing shoes without socks, and trim toenails as mention in the booklet. 3. Continue his daily exercise (walking 30 minute), but with socks and sport shoes instead of sandals. 4. Reduce sweet snacks and fruit juice consumption (only one piece of sweet snack and one glass of fruit juice/week) by taking soya milk instead. 5. Ask his daughter and/wife to be his reminder 	The subject perceived his delirium and forgetfulness as the main barriers to achieve the goal(s) that had already been set. However, those difficulties were solved by asking his daughter and/or his wife to be his remainder.
II	Goals for at least one week after discharge: <i>a. Foot care behaviors goal:</i> performing foot inspection daily, no bare foot inside/outside home, trimming toenails properly, drying foot after taking a bath/shower, applying lotion, and massaging foot properly. <i>b. Smoking cessation goal:</i> stop smoking completely. <i>c. Exercise behaviors goal:</i> performing indoor exercise (static bicycle). <i>d. Diet behaviors goal:</i> improving diet behavior	<ol style="list-style-type: none"> 1. Use the booklet and/or leaflet provided as a guide to perform foot care and consult dermatologist to find the best solution for his ingrown toenails problem 2. Inspect foot conditions, dry the foot, and apply lotion after taking a bath/shower, wear proper sandals inside/outside, avoid wearing shoes without socks, and trim toenails as mention in the booklet, and massage the foot properly. 3. Ask him wife to remind him about smoking cessation and support him during performing the plans including diet and exercise plans that had already been set before, and minimize working stress by playing card with his crews when he felt bored or stressed. 4. Utilize the static bicycle that he bought several months before admitted but never used. 5. Reduce fatty food, such as pork (once a month) and replace it with fish/sea food. 	Subject did not mention any possible difficulties that might appear as barriers.
III	Goals for at least one week after discharge, represented by the wife of the subject:	(To achieve those goals, different from the previous subjects, the subject reported that all of the plans would be set by his	Subject and his wife did not inform any difficulties.

Subject	Goal Statement	Action Plans Statement	Perceived Difficulties
	<p>a. <i>Foot care behaviors goal</i>; performing foot inspection 3 times/week, no bare foot inside/outside home, trimming toe nails properly (performed by the daughter), drying foot after taking a bath/shower, and applying lotion and performing foot massage (assisted by the wife).</p> <p>b. <i>Exercise behaviors goal</i>; performing static exercise (chair exercise), coconut shell exercise, and walking (indoor and around his house).</p> <p>c. <i>Diet behaviors goal</i>: reducing coffee consumption (from 1 glass everyday to be 1 cup/week) and increasing fresh fruit consumption (except too sweet fruits (durian, rambutan, mango), and banana because during hospitalization he experienced hyperkalemia).</p>	<p>wife).</p> <p>His wife informed that:</p> <ol style="list-style-type: none"> 1. She would remind him to examine, clean and inspect his foot daily (when taking a bath), and use the leaflet given as a guide to assist her husband to perform diabetic foot care. 2. She would ask his daughter help her father trim toenails as showed in the booklet. 3. She would accompany and remind her husband to perform exercise regularly. 4. She would assist her husband in managing his diet properly. 	<p>However, based on the information gained during the process, he could not independently performed his plans and need her support to assist him to perform properly. Therefore, we encouraged and reinforced his wife and his daughter to assist him as much as possible.</p>
IV	<p>Goals for at least one week after discharge:</p> <p>a. <i>Foot care goal</i>: performing foot inspection daily, no bare foot inside/ outside home, trimming toe nails properly (performed by salon), drying foot after taking a bath/shower, and applying moisturizer lotion.</p> <p>b. <i>Exercise goal</i>; performing regular exercise</p> <p>c. <i>Diet behavior goal</i>: continuing the regular diet (low fat, low sugar, and low salt), reducing rice consumption and increasing fruits consumption.</p> <p>d. <i>Regular check up</i>: continuing regular check up and ask the healthcare provider to assess and provide care/suggestion related to the foot condition during the check-up session.</p>	<ol style="list-style-type: none"> 1. Use the booklet and/or leaflet provided as guide for him to perform diabetic foot care 2. Inspect foot conditions, dry the foot after take a bath and apply moisturizer after shower, and wear proper sandals inside/outside. 3. Ask his wife to accompany him during exercise, perform static exercise (chair exercise) that would be gradually increased either on the duration or portion according to his cardiovascular capability. 4. Ask his wife to assist him in preparing the daily diet, minimize rice consumption and continue other diets (low fat, low sugar, and low salt) 5. Ask his wife to be his reminder about diet, foot care, exercise, and regular check up plans that he already set during hospitalization. 	<p>He did not mention any difficulties, but he informed that he was concerned about his dyspnea and his cardiac function post operation (CABG) and what type of exercise and activities that should be avoided and should be improved to improve his cardiac function.</p>

Kapoor, Chandalia, & Lamba, 2008; Olson et al., 2009; Pollock, Unwin, & Connolly, 2004). Moreover, from the demographic data it was revealed that most of them had never received information regarding diabetic foot care. Data from physical assessment noted that all subjects were at high risk for foot ulceration. Considering the prior knowledge scores, the highest score was found in subject II (10) who reported that he had received diabetic foot care information before, while the low and the lowest score were found in Subject I (7), Subject IV (7), and Subject III (6) who had never received any diabetic foot care information. This finding was consistent with previous evidence showing that diabetic patients who received diabetic foot care information had significantly better foot care knowledge than those who did not (Johnston et al., 2006; Schmidt, Mayer, & Panfil, 2008). In addition, the post-test, goal setting and action planning, and follow up phone call results demonstrated that all subjects had improved their diabetic foot care knowledge and behaviors. These data strengthen the previous findings which found that education intervention could effectively improved patients' foot care knowledge and behaviors (Corbett, 2003; McMurray et al., 2000; Valk et al., 2005; Vatankhah et al., 2009).

Furthermore, with regard to the cultural issues in question No. 8, it seems that diabetic foot care was closely related to the patients' habit and culture. Culturally, Thai people concern about cleanliness and usually leave their footwear outside the house. It was also reported in the previous study that walking barefoot, either inside or outside the house was a common habit in developing countries (Abbas & Morbach, 2005).

Regarding result of pretest on diabetic foot care behaviors, Subject II had the highest score (74.2%) and subject III had the lowest score (28.42%). When we further clarified, it was because Subject II had numbness and ingrown toenails on both thumbs. Therefore, this condition inevitably increased his awareness and motivated him to frequently examine his feet and maintain them properly. This phenomenon capitalized the previous evidence which reported that diabetic complications might improve patients' foot care behaviors (Schmidt, Mayer, & Panfil, 2008). The better diabetic foot care behaviors in Subject II might also relate to his overt personality, his adherence to regular check up, and his experience in DM foot educational program. His overt personality facilitated him to be more adjusted to his complicated condition. He used to enthusiastically discuss the conditions and tried to find any possible solutions. Additionally, his adherence to the regular check up and treatment allowed him to be more accessible to the diabetic foot care information. Therefore, with all of these conditions, it was not surprised if he had better score on foot care knowledge and behaviors.

Conversely, some studies noted that disease complications was closely related to physical inability and could possibly be a barrier of self-foot care performance (Johnston et al., 2006; Olson et al., 2009). In the present study, nearly similar phenomenon was observed in Subject III who had bladder cancer that finally developed severe complications (urinary tract infection and end stage renal diseases). It was noted that he had lowest diabetic foot care knowledge (50%) and behaviors score (42%). In addition, based on his wife explanation he was worried about kidney problem and perceived it as a very severe disease. During the assessment, although he was able to perform activities daily living independently, he looked apathy, hesitated to communicate, and lack of eye contact. All of these data indicated that he might experience psychological distress (depression). One study found that patients who had persistent depressive symptoms experienced difficulties to perform self-management (Bayliss, Ellis, & Steiner, 2007). Not only lack of diabetic foot care practice, Subject III also reported that he did not adhere neither to DM diet program, regular check up, nor exercise program.

Considering patients' foot care behaviors (Table 4), particularly avoiding potential damaging foot sub-category, subject I, III, and IV had scored less than 50% of the maximum score. This sub-category consists of four items including checking water temperature, use of callus/corn cream, walking barefoot inside/outside the house. This low score might relate to some items that stated as uncommon. For checking water temperature, most subjects reported that they had rarely or never used warm water for washing/soaking the foot, therefore, it was not necessary for them to check the water temperature. In addition, they informed that using cream or lotion was uncommon/strange, particularly for late adult/elderly men, it was commonly used only by women.

In the goal setting and action planning, all subjects were able to perform it properly. In the evaluation session, all subjects reported that they would apply their action plan(s) to achieve the goal that they stated before. Consistently, in the phone call follow up session two, subjects reported that during one week after discharge, they performed their plans and achieved better foot care behaviors. These findings supported the previous findings that implementation of goal setting and action planning method effectively improved diabetic patients' knowledge and behaviors (DeWalt et al., 2009).

From the previous descriptions, there were some factors that might influence patients' diabetic foot care behaviors such as patients' foot care knowledge, DM and other disease complications, psychological status, cultural value, and educational intervention. Patients who had better diabetic foot care knowledge, experienced diabetic foot related complications,

and attended diabetic foot care educational program were more likely to have better diabetic foot care behaviors than patients who did not have those characteristics. Conversely, patients who developed non-diabetic foot related complications and develop psychological problems were more likely to have worse diabetic foot care behaviors.

We have found that applying goal setting approach is simple, applicable, and has many benefits. The main advantage of this approach is high involvement of patients' participation in managing their treatment program. By getting involved during the process of goals and plans setting, they are allowed to predict the possible barriers that may inhibit their goal achievement. Moreover, when they find the difficulties, they already have some anticipations or solutions to deal with. By setting their own goal and action plans, most plans already match with their daily activities. It was proved in this present study that when patients discussed any possible difficulties, most of them did not find any difficulties. For chronic diseases, those aspects were very important, because the plan (behavioral change) that they achieved should be maintained and improved along their life period.

Conclusion and Clinical Implications

In short, the hospitalized DM patients included in the present study needed diabetic foot care knowledge and behaviors improvement. Their foot care knowledge and behaviors were influenced by many factors including patients' characteristic (age and personality), complications of DM or other disease, psychological status and their experiences in attending foot care educational program. The program the authors applied effectively improved hospitalized DM patients' foot care knowledge and facilitated their foot care behaviors. Implementing goal setting, which approach in improving hospitalized diabetic patients' foot care knowledge and behaviors, is simple, feasible, and provide many benefits. Therefore, it is highly recommended for nurses to apply this evidence-based practice to contribute in improving quality of diabetic care.

References

- Abbas, Z. G., Lutale, J. K., Game, F. L., & Jeffcoate, W. J. (2008). Comparison of four systems of classification of diabetic foot ulcers in Tanzania. *Diabetic Medicine*, 2, 134-137.
- Abdelgadir, M., Shebeika, W., Eltom, M. Berne, C. & Wikblad, K. (2008). Health related Quality of life and sense of coherence in Sudanese diabetic subjects with lower limb amputation. *Tohoku Journal of Experimental Medicine*, 217, 45-50.

- American Diabetes Association (ADA). (2004). Preventive foot care in diabetes. *Diabetes Care*, 27(suppl 1), s63-s64.
- Bayliss, E. A., Ellis, J. L., & Steiner, J. F. (2007). Barriers to self-management and quality of life outcomes in seniors with multimorbidities. *Annals of Family Medicine*, 5, 395-402.
- Canadian Diabetes Association [CDA]. (2005). Approached treatment of a patient with diabetic ulcer. Retrieved on December 10, 2009, from <http://www.diabetes.ca/>
- Canadian Diabetes Association. [CDA]. (2008). Canadian Diabetes Association 2008 clinical practice guidelines for the prevention and management of diabetes in Canada. *Canadian Journal of Diabetes*, 32, Sup1.
- Calle-Pascual, A. L., Duran, A., Beneda, A., Calvo, M. I., Charro, A., Diaz, J. A. et al. (2001). Reduction in Foot Ulcer Incidence. *Diabetes Care*, 24, 405-407.
- Chandalia, H. B., Singh, D., Kapoor, V., Chandalia, S. H., & Lamba, P. S. (2008). Footwear and foot care knowledge as risk factors for foot problems in Indian diabetics, *International Journal of Diabetes in Developing Countries: Medical Knowledge Publications & Media Pvt. Ltd.*
- Corbett, F. C. (2003). A Randomized Pilot Study of improving Foot Care in Home Health Patients with diabetes. *The Diabetes Educator*, 29; 273-282.
- DeWalt, D., Davis, T. C., Wallace, A. S., Seligman, H. K., Bryant-Shilliday, B., Arnold, C. L., et al. (2009). Goal setting in diabetes self-management: Taking the baby steps to success. *Patient Education and Counseling*, 77, 218-223.
- Edmonds, M. (2006). Diabetic foot ulcers: practical treatment recommendations. *Drugs*, 66, 913-929.
- Ellis, S. E., Speroff, T., Dittus, R. S., Brown, A., Pichert, J. W., & Elasy, T. A. (2004). Diabetes patient education: a meta-analysis and meta-regression. *Patient Education and Counseling*, 52, 97-105.
- Funnell, M. M., & Anderson, R. M. (2000). The problem with compliance in diabetes. *the journal of the American Medical Association*, 284, 1709.
- Ghanassia, E., Villon, L., Thuan dit Dieudonne, J. F. O., Boegner, C., Avignon, A., & Sultan, A. (2008). Long-Term Outcome and Disability of Diabetic Patients Hospitalized for Diabetic Foot Ulcers. *Diabetes Care*, 31, 1288-1292.
- Handley, M., MacGregor, K., Schillinger, D., Sharifi, C., Wong, S., & Bodenheimer, T. (2006). Using Action Plans to Help Primary Care Patients Adopt Healthy Behaviors: A Descriptive Study. *The Journal of the American Board of Family Medicine*, 19, 224-231.
- Jayaprakash, P., Bhansali, S., Bhansali, A., Dutta, P., & Anantharaman, R. (2009). Magnitude of foot problems in diabetes in the developing world: a study of 1044 patients. *Diabetic Medicine*, 26, 939-942.
- Jeffcoate, W. J. & Harding, K. G. (2003). Diabetic foot ulcer. *Lancet*, 361, 1545-1551.
- Johnston, M. V., Pogach, L., Rajan, M., Mitchinson, A., Krein, S. L., Bonacker, K. et al. (2006). Personal and treatment factors associated with foot self-care among veterans with diabetes. *Journal of Rehabilitation Research and Development*, 43, 227-238.
- Lincoln, N. B., Jeffcoate, W. J., Ince, P., Smith, M., & Radford, K. A. (2007). Validation of a new measure of protective footcare behaviour: the Nottingham Assessment of Functional Footcare (NAFF). *Practical Diabetes International*, 4, 207-211.

- Lincoln, N. B., Radford, K. A., Game, F. L., & Jeffcoate, W. J. (2008). Education for secondary prevention of foot ulcers in people with diabetes: A randomized controlled trial. *Diabetologia*, *51*, 1954-1961.
- Lorig, K. R. & Holman, (2003). Self-Management Education: history, definition, outcomes, and mechanisms. *Annals of Behavioral Medicine*, *26*, 1-7.
- Lorig, K. R., Hurwicz, M.-L., Sobel, D., Hobbs, M., & Ritter, P. L. (2005). A national dissemination of an evidence-based self-management program: a process evaluation study. *Patient Education and Counseling*, *59*, 69-79.
- Martin, C. G., & Deepak, M. (2002). Diabetic foot disease and foot care in a Caribbean community. *Diabetes Research and Clinical Practice*, *56*, 35-40.
- McMurray, S. D., Johnson, G., Davis, S., & McDougall, K. (2002). Diabetes education and care management significantly improve patient outcomes in the dialysis unit. *American Journal of Kidney Diseases*, *40*, 566-575.
- Olson, J. M., Hogan, M. T., Pogach, L. M., Rajan, M., Raugi, G. J., & Reiber, G. E. (2009). Foot care education and self management behaviors in diverse veterans with diabetes. *Patient Prefer Adherence*, *3*, 45-50.
- Pollock, R. D., Unwin, N. C., & Connolly, V. (2004). Knowledge and practice of foot care in people with diabetes. *Diabetes Research and Clinical Practice*, *64*, 117-122.
- Ragnarson, Tennvall G., & Apelqvist J. (2004). Health-economic consequences of diabetic foot lesions. *Clinical Infectious Diseases*. *39*, 132-139.
- Registered Nurses' Association of Ontario (RNAO). (2007). Reducing foot complications for people with diabetes. *Guideline Supplement*. Toronto (ON): Registered Nurses' Association of Ontario (RNAO).
- Schmidt, S., Mayer, H., & Panfil, E. M. (2008). Diabetes foot self-care practices in the German population, *Journal of Clinical Nursing*. *17*, 2920-2926.
- Singh, N., Armstrong, D. G., & Lipsky, B. A. (2005). Preventing foot ulcers in patients with diabetes. *The Journal of the American Medical Association*, *293*, 217-228.
- Stockl K, Vanderplas A, Tafesse E., & Chang E. (2004). Costs of lower-extremity ulcers among patients with diabetes. *Diabetes Care*, *27*, 2129-2134.
- Vatankhah, N., Khamseh, M. E., Jahangiri Noudeh, Y., Aghili, R., Baradaran, H. R., & Safai Haeri, N. (2009). The effectiveness of foot care education on people with type 2 diabetes in Tehran, Iran. *Primary Care Diabetes*, *3*, 73-77.
- Valk G. D., Kriegsman, D. M. W., & Assendelft W. J. J. (2005). Patient education for preventing diabetic foot ulceration. *Cochrane Database of Systematic Reviews*, *1*, 1-43.
- Warsi, A., Wang, P. S., LaValley, M. P. Avorn, J., Solomon, D. H. (2004). Self-management Education programs in chronic disease. *Archives of Intern Medicine*, *164*, 1641-1649.