The Effect of Foot Care Camp on Diabetic Foot Care Knowledge and Behaviors of Individuals With Diabetes Mellitus in Indonesia

Angger Anugerah Hadi Sulistyo

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Nursing Science (International Program)

Prince of Songkla University

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I hereby certify that this work has not been accepted in substance for any degree, and is not being currently submitted in candidature for any degree.

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ชื่อวิทยานิพนธ์ ผลของโปรแกรมค่ายเบาหวานต่อความรู้และทักษะในการดูแลเท้าในผู้ป่วยเบาหวาน ประเทศอินโดนีเซีย

ผู้เขียน นายแองเกอร์ อนูจีราสต์ ฮาดิ ซูลิสโย (Angger Anugerah Hadi Sulistyo)

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บทคัดย่อ

การวิจัยเชิงทดลองครั้งนี้มีวัตถุประสงค์เพื่อศึกษาผลของโปรแกรมค่ายเบาหวานต่อความรู้และทักษะในการดูแลเท้าในผู้ป่วยเบาหวาน กลุ่มตัวอย่างจำนวน 72 รายที่มีคุณสมบัติตามเกณฑ์ได้รับคัดเลือกจากศูนย์สาธารณสุขที่ใหญ่ที่สุด จำนวน 2 แห่ง ในเมือง โบโจนีโกโร (Bojonegoro) จังหวัด อิส จาวา (East Java) ประเทศอินโดนีเซีย แบ่งกลุ่มตัวอย่างเป็นกลุ่มทดลอง (n = 37) และกลุ่มควบคุม (n = 35) กลุ่มควบคุมได้รับการดูแลตามปกติจากศูนย์สาธารณสุข กลุ่มทดลองได้รับการดูแลปกติร่วมกับโปรแกรมค่ายเบาหวาน เป็นเวลา 5 สัปดาห์ โปรแกรมค่ายเบาหวานประกอบการได้รับความรู้และฝึกทักษะด้วยการเข้าค่ายครึ่งวัน เป็นระยะเวลา 2 วัน การติดตามทางโทรศัพท์ทุกสัปดาห์ เป็นเวลา 3 สัปดาห์ และการประเมินผลความรู้และทักษะในการดูแลเท้าในสัปดาห์ที่ 5 โดยใช้แบบสอบถามความรู้และทักษะการดูแลเท้าฉบับแก้ไข โปรแกรมความรู้และทักษะการดูแลเท้า แบบสอบถามความรู้และทักษะในการดูแลเท้าฉบับแก้ไข ผ่านการตรวจสอบความตรงเชิงเนื้อหาจาผู้ทรงคุณวุฒิ 3 ท่าน และแบบสอบถามความรู้และทักษะในการดูแลเท้าฉบับแก้ไข ผ่านการตรวจสอบความเที่ยง ด้วยสถิติ KR-20 และ ครอนบราค แอฟ่า ได้ค่าสัมประสิทธิ์สหสัมพันธ์เท่ากับ .75 และ .81 ตามลำดับ

ผลการศึกษาพบว่าค่าเฉลี่ยคะแนนความรู้การดูแลเท้าของกลุ่มทดลอง (M = 11.59, SD = 2.02) หลังการเข้าค่ายเบาหวานสูงกว่ากลุ่มควบคุม(M = 9.34, SD = 2.22) อย่างมีนัยสำคัญทางสถิติ (p < .001) และค่าเฉลี่ยคะแนนทักษะการดูแลเท้าของกลุ่มทดลอง (M = 73.51, SD = 13.16) หลังการเข้าค่ายเบาหวานสูงกว่ากลุ่มควบคุม (M = 51.23, SD = 9.91) อย่างมีนัยสำคัญทางสถิติ (p < .001) นอกจากนี้ ค่าเฉลี่ยคะแนนความรู้และทักษะ

การดูแลเท้าภายในกลุ่มทดลองหลังการเข้าค่ายเบาหวานสูงกว่าก่อนการทดลองอย่างมีนัยสำคัญทางสถิติ ($p < .001$ ตามลำดับ)

การศึกษาครั้งแสดงให้เห็นว่าโปรแกรมค่ายเบาหวานมีผลเพิ่มความรู้และทักษะในการดูแลเท้าของผู้ป่วยเบาหวาน ดังนั้นพยาบาลควรนำโปรแกรมนี้ไปใช้ในการดูแลผู้ป่วยเบาหวานเพื่อป้องกันการเกิดแผลที่เท้าและการถูกตัดขาในที่สุด

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Abstract

This quasi-experimental study aimed to examine the effect of Foot Care (FC) Camp on Diabetic Foot Care Knowledge (DFCK) and Diabetic Foot Care Behaviors (DFCB) among participants with diabetes. Seventy-two participants who met inclusion criteria were selected from the two biggest DM population of public health centers in Bojonegoro, East Java, Indonesia. Participants were divided into experimental (n = 37) and control group (n = 35). In the control group, participants received standard care provided by the public health center, whereas those in the experimental group received standard care plus FC camp. The intervention was given a five-week period. It consisted of a half-day of educational session for two days and weekly follow-up telephone call contacts for three weeks. The DFCK and DFCB were examined on the fifth week. The DFCK and DFCB were determined by the Modified Diabetic Foot Care Knowledge (MDFCK) and the Modified Diabetic Foot Care Behaviors (MDFCB) questionnaires. The content validity of educational session, MDFCK questionnaire, and MDFCB questionnaire were validated by three experts.

The internal reliability test showed that the MDFCK questionnaire yielded a KR-20 coefficient of .75 and the MDFCB yielded a Cronbach's alpha coefficient of .81.

The findings showed that the mean score of DFCK in the experimental group after completing the FC camp was significantly better (M = 11.59, SD = 2.02) than that in the control group (M = 9.34, SD = 2.22) ($p < .001$). Similarly, the mean score of DFCB in the experimental group after completing the FC camp (M = 73.51, SD = 13.16) was significantly better than that in the control group (M = 51.23, SD = 9.91) ($p < .001$). The result within experimental group also showed that the post-test mean score of posttest of DFCK and DFCB were significantly higher than that in the pre-test ($p < .001$, respectively).

Based on the findings of this study, FC camp proved to enhance DFCK and DFCB among diabetics' patients. Therefore, this program can be utilized for nursing practice in order to prevent diabetic foot ulcer and foot amputation.

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Angger Anugerah Hadi Sulistyo

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Chapter 1

Introduction

This chapter presents the background and significance of the problem, objectives of the study, research questions, conceptual framework, and definition of terms.

Background and Significance of the Problem

Diabetes mellitus (DM) is a rising global health issue. Approximately 387 million people worldwide are diagnosed with DM (International Diabetes Federation [IDF], 2014). In South East Asia, it affects 78 million people and predicted to rise up to 140 million cases by 2040 (IDF, 2014). DM is one of the top 10 diseases that causes death in Indonesia and a recent study reported 9 million cases (Center for Disease Control and Prevention [CDC], 2015). DM generates some serious complications including microvascular complications (impaired vision, renal failure, loss of sensation, and foot ulcer) and macrovascular complications (myocardial infarction, stroke, and ischemia) (Walker, Ralston, & Penman, 2013).

Diabetic foot ulcer (DFU) is the most common DM complication which is costly and has devastating adverse effects (Yazdanpanah, Nasiri, & Adarvishi, 2015). More than 25 % of DM patients go through DFU during their lifetime (Armstrong, Wrobel, & Robbins, 2008). Cronenwett and Johnston (2014) found that 6.8 % of DM patients suffer from DFU. Additionally, DFU is strongly correlated with high morbidity and mortality rates (Jeffcoate & Harding, 2003). It is estimated that annually1 million limb amputations occur due to DFU. According to Aumiller and Dollahite (2015) in the United States alone, DFU has led to 80.000 amputations per

year. In comparison, there is no reported study to quantify the number of amputations brought about DM in Indonesia. However, data from the Indonesian Hospital Association (PERSI), DFU reported that DFU has accelerated a mortality rate of 17-23 % and amputation rate of 15-30 %. Therefore, prevention of DFU is necessary, particularly in Indonesia where educational programs of DFU prevention are limited.

Accordingly, DFU can be prevented through several strategies. The strategies of DFU prevention include the following (1) daily foot inspection, (2) daily foot hygiene, (3) avoiding any potential damaging activity, (4) using appropriate footwear, and (4) toenail care (Bakker, Apelqvist, & Schaper, 2012). Based on Indian Health Diabetes Best Practice Foot Care Guidelines (2011), smoking cessation, glycemic control, and lipid management are parts of DFU management that have also become fundamental components to prevent DFU. Over and above the basic management of care, daily assessment such as foot observation help DM patients identifies early signs of foot abnormalities. Likewise, lack of adequate knowledge and behaviors to prevent DFU were reported to be the most common problem in DFU prevention (Beattie, Campbell, & Vedhara, 2014).

Enhancing foot care knowledge and behaviors are essential to prevent or delay the complications in patients with DM who are prone to develop DFU. Based on Kurniawan, Sae-Sia, Maneewat, and Petpichetchian (2011), patients with good knowledge of diabetic foot care can potentially contribute to the preventive action of DFU. According to one systematic review, knowledge improvement is one of the main desired outcomes that determine the prevention of foot ulcer development (Sharoni, Khuzaimah, Minhat, Zulkefli, Afiah, & Baharom, 2016). Another study reported that patients with adequate foot care knowledge and behavior prevented or

had delayed diabetic related complications, such as lower extremities circulation problems and peripheral neuropathies (International Working Group on the Diabetic Foot [IWGDF], 2011). Foot care behaviors are also determined by blood glucose control, which is an important preventing factors of foot ulcer development (Registered Nurses' Association of Ontario [RNAO], 2013).

The studies regarding DM foot care knowledge and behaviors have been conducted in several regions in Indonesia (Kurniawan et al., 2011; Nurhayati, 2017; Setiawati, 2017). A study from Central Java of Indonesia revealed that majority of patients with DM (81 %) had foot care knowledge at low to moderate levels (Nurhayati, 2017). Another study from Surakarta, Indonesia found that the DM foot care knowledge and behaviors among DM patients were at a low-level percentage (Setiawati, 2017). Therefore, a program to enhance knowledge and behaviors seem to be the best-fit healthcare program in preventing diabetic foot ulcer, particularly in Indonesia.

According to literature reviews, a health education program has been used as one of the strategies to enhance foot care knowledge and behaviors (RNAO, 2013; Indian Health Diabetes Best Practice Foot Care Guidelines, 2011). In addition, various strategies for an educational program proved to effectively improve foot self-care practice among DM patients. A face-to-face or individual education program is one of the approaches, which is effective for transferring knowledge to enhance foot care behaviors (Fan, Sidani, Cooper-Brathwaite, & Metcalfe, 2013; Kurniawan et al., 2011). However, a face-to-face educational procedure needs certain resources which are not always available in every health care system, particularly in developing countries. For example, in the Indonesian context, because of the discrepancy ratio

between health care providers and the DM population, a face-to-face or individual educational program will ultimately increase the workload of health care providers. Although educational programs have proved to be effective to enhance foot care behaviors, the most efficient and effective strategies still need continuous evaluation.

Most of the studies provided a lecture on group-based and individual-face to face educational program (Fan et al., 2013; Monami et al., 2015; Pérez-Borges et al., 2015). It is attested that studies enhancing foot care knowledge and behaviors are usually conducted in the form of teacher-centered with didactic manner (Pérez-Borges et al., 2015; Monami et al., 2015). On the other hand, health education with traditional lectures using didactic manners is more likely boring for some audiences (Baid & Lambert, 2010). The combination of health education with fun activity, recreational activity, or involving multimedia technology (picture and video) were believed to capture more attention from audiences and provided less stressful education environment (Baid & Lambert, 2010).

In order to enhance knowledge and behaviors, camp is another well-known strategy that provides an educational program in a nonclinical atmosphere. Various studies proved that camps improve knowledge (Chaichanwattanakull, Wekawanichz, Dumrongphol, Sriwijitkamol, Peerapatdit, & Nitiyanant, 2012; Karagüzel, Bircan, Erişir, & Bundak, 2005; Mercuri et al., 2009), skills (Karagüzel et al., 2005), behaviors (Chaichanwattanakull et al., 2012; Suphornin, Hongsranagon, & Pakdeesamai, 2009), and quality of life (Chaichanwattanakull et al., 2012). Camp is defined as a supervised program for people with the same problem or experience in a medically safe environment (American Diabetes Association [ADA], 2012). Camp allowed patients to participate in educational session through recreational and relaxing

activities to improve the patients' self-management (McAuliffe-Fogarty, Ramsing, & Hill, 2007). Camp facilitates positive experience through group discussion, support sessions, and interactive learning activities. At the same time, it provides an environment where patients can share their conditions with each other. Generally, camping program is established to enhance psychological and social aspects in chronically ill patients (Moola et al., 2013). Camping program is commonly used to provide recreational education in children and in the youth population with DM (ADA, 2012; Békési et al., 2011; Chaichanwattanakull et al., 2012; Mercuri et al., 2009). Yet, the application of a camp environment to specifically prevent the occurrence of DFU in the adult population has not been reported.

The concept of diabetic camp purposed by Beljic (2007) aimed to enhance knowledge and behaviors regarding diabetes management in the elderly population. This diabetic camp consisted of several concepts including motivating, learning, and socializing. The author gathered these three concepts into a structured educational program in order to approach the desired outcomes. The desired outcomes of the camp were to enhance the participants' knowledge through learning, improving the application of knowledge to skill management by motivating, and sharing of experiences and best practices concluded in socializing in an open and safe environment. Since the purpose of a foot care camp (FC camp) proposed in this study is to enhance knowledge and behaviors, which is similar to a diabetic camp as mentioned earlier, the concept of the diabetic camp is by all means effective to enhance the outcomes of FC camp.

Based on a literature review, the measured outcomes of previous studies did not represent the overall components of diabetic foot care behaviors. In a study

conducted by Chin, Liang, Wang, Hsu, and Huang (2014), the researchers only measured the behaviors of daily washing and foot drying, inspecting foot for problems, moisturizing, and using appropriate footwear. However, the other behaviors were measured, such us properly healthy diet, daily exercise, trimming toenails, avoiding any potential foot-damaging activities, and taking proper care of any foot injury. For this reason, a questionnaire is necessary to capture desired foot care behavior items in its entirety.

In the context of Indonesia, Bojonegoro is a city in East Java Province that has 36 public health centers (Ministry of Health of Bojonegoro District, 2015). In general, the public health centers provide health care including prevention, promotion, treatment, and rehabilitation to all kinds of diseases including DM. The standard care in DM patients in each public health center is an educational program including diet, exercise, and medication. The education regarding diabetic foot care knowledge is provided when patients complain of neuropathic symptoms or when the physician is cognizant of any foot deformities. In 2015, local health authorities revealed that the number of DM patients in the 36 public health centers totaled to 23,111 cases (Ministry of Health of Bojonegoro District, 2015). Therefore, an effective and efficient health care program is needed to improve diabetic foot care knowledge and behaviors in Bojonegoro.

Objectives of the Study

The objectives of this study as follow:

1. Compare diabetic foot care knowledge between participants who received standard care and those who attended the Foot Care Camp.
2. Compare diabetic foot care behaviors between participants who received standard care and those who attended the Foot Care Camp.
3. Compare diabetic foot care knowledge before and after the Foot Care Camp.
4. Compare diabetic foot care behaviors before and after the Foot Care Camp.

Research Questions

The research questions of this study were:

1. Is diabetic foot care knowledge in participants who attend the Foot Care Camp better than those who receive standard care?
2. Are diabetic foot care behaviors in participants who attend the Foot Care Camp better than those who receive standard care?
3. Is diabetic foot care knowledge in participants after the Foot Care Camp better than before?
4. Are diabetic foot care behaviors in participants after the Foot Care Camp better than before?

Conceptual Framework

The Foot Care Camp (FC camp) in this study integrates the concept of a camp that was purposed by Beljic (2007) and the prevention of DFU based on Indian Health Diabetes Best Practice Foot Care Guideline (2011). The FC camp

consisted of three major concepts that include motivating, learning, and socializing (Beljic, 2007). These three concepts of the FC camp was integrated into the activities of a five-week camp. In the motivational concept, activities during the camp provided a chance for participants to receive companionship and emotional support. Based on Beljic (2007), patients with DM could get motivation from the trainer and peers to perform diabetic management. Participants achieved motivation during the educational session, discussion session, meal time, recreational activity and telephone call sessions. In the learning concept, the participants received knowledge regarding DFU prevention from the trainer. The educational contents of the FC camp were based on Indian Health Diabetes Best Practice Foot Care Guideline (2011). They were composed of general diabetic management that includes controlling blood glucose, controlling blood pressure, controlling lipids, smoking cessation, and foot care management including daily foot assessment, maintaining foot hygiene, maintaining foot moisture, proper toenail trimming, selecting proper footwear, avoiding any potential foot-damaging activities, and properly taking care of any foot injury (Indian Health Diabetes Best Practice Foot Care Guideline, 2011). The camp promotes learning by the participants by providing educational sessions through several methodologies including group learning, presentations, discussions, and practice (Beljic, 2007). The purpose of the learning concept in the camp was to enhance management skills, practices, and to share knowledge among the participants in an unthreatening and open environment. The third concept was socializing. The camp supported meeting and getting together with the participants, trainer, and researcher by group-based activities. Based on Beljic (2007), socializing among the participants could be achieved by sharing experiences during the discussion and

recreational activity as well. The purpose of socializing concept was to improve the participants' confidence in the application of diabetic foot care practice by interacting with others who faced similar problems.

In this study, the FC camp was a five-week program including a half-day for 2 days of camp activities, 3 weeks of brief telephone call counseling, and face-to-face interviews during the last week to gather post-camp data. The activities of the camp consisted of (1) assessing the participants' prior knowledge regarding diabetic foot care and assisting the participants in assessing their current diabetic foot care behavior by multiple choice questionnaires, (2) providing group-based educational sessions regarding general diabetic management and desired DFCB via lectures, videos, discussions and a booklet, (3) providing a practice session regarding DFU prevention, (4) facilitating recreational activities including local dancing and walking around the campgrounds with appropriate footwear and promoting no barefoot walking, (5) providing meals and snack times which are suitable for the activities and diabetes management, and (6) facilitating discussion sessions regarding DM experiences, potential barriers in implementing foot care, and questions that arise among the participants.

The participants were contacted for a brief follow-up counseling session by telephone call once a week for 3 weeks. During the follow-up sessions, the researcher assessed the participants' current foot care behaviors and their concerns regarding the performance of desired foot care. The researcher assisted the participants in solving those concerns and encourage the participants to continuously maintain desired foot care. In the last telephone call session, the researcher reminded the participants of the foot care strategies and of the next follow-up session. In the fifth week, all

participants were gathered in the public health centers to get their monthly general check-up. During that event, the researcher distributed the questionnaires to examine the post-camp DFU knowledge and behaviors. The study framework was proposed in Figure 1.

Foot Care Camp	
Camp Components	Activities
Motivating	1. Encourage participants to apply general DM management during group-based educational session 2. Encourage participants to apply desired diabetic foot care practice during group-based educational session and practice session 3. Encourage participants to use proper footwear and no barefoot walking during recreational activities 4. Encourage participants to eat the foods that appropriate with diabetes diet during meal time 5. Provide reinforcement based on participants achievement during telephone call session 6. Encourage participants to continuously maintain desired foot care practice and overcome barrier appeared during telephone call session
Learning	1. Provide lecture regarding general DM management and desired diabetic foot care practice during group-based educational and practice session 2. Provide video related to desired diabetic foot care behaviors 3. Assist discussion regarding information that participants get form lecture during discussion session 4. Provide brief education regarding meals and snacks which are suitable in diabetic management during meal time
Socializing	1. Assist discussion among participants regarding DM experiences and potential barriers in implementing foot care during discussion session 2. Assist interactive learning during recreational activity

Diabetic Foot Care Knowledge (DFCK)

General DM management

1. Blood glucose control
2. Blood pressure control
3. Lipids control
4. Smoking cessation

Foot care management

5. Daily foot examination
6. Foot hygiene
7. Foot moisture
8. Toenail care
9. Proper footwear
10. Foot injury prevention/ foot injury care

Diabetic Foot Care Behavior (DFCB)

General DM management

1. Checking and recording blood glucose level regularly
2. Checking and recording blood pressure regularly
3. Regularly exercise
4. Stop smoking habit

Foot care management

5. Daily foot assessment
6. Maintaining foot hygiene
7. Maintaining foot moisture
8. Trimming toenails properly
9. Selecting proper footwear
10. Avoiding any potential foot-damaging activities
11. Taking care any foot injury properly

Figure 1. Conceptual Framework of FC Camp to Enhance Diabetic Foot Care Knowledge and Behaviors

Hypotheses

The specific hypotheses as follow:

1. Diabetic foot care knowledge of the participants in the FC camp is better than the knowledge of the participants who received standard care.
2. Diabetic foot care knowledge of the participants in the FC camp is better than before they participated in the FC camp.
3. Diabetic foot care behaviors of participants in the FC camp are better than the behaviors of the participants who received standard care.
4. Diabetic foot care behaviors of participants after they participated in the FC camp are better than before they participated in the FC camp.

Definition of Terms

Foot care camp (FC camp). FC camp was a program to improve participants' diabetic foot care knowledge and behaviors in terms of general DM management and foot care management in DM population based on Beljic's (2009) and Indian Health Diabetes Best Practice Foot Care Guideline (2011). The FC camp integrated concepts of motivating, learning, and socializing through a five-week camp program. The activities during FC camp included assessing participants' diabetic foot care knowledge and behaviors prior the camp, providing information and skill regarding desired foot ulcer prevention activities, assisting participants' to socialize with similarly affected participants, providing motivation for participants to continuously maintain desired foot care, and assessing participants' diabetic foot care knowledge and behaviors after the camp.

Diabetic foot care knowledge (DFCK). DFCK referred to the capabilities of the participants to remember and understand information regarding DFU prevention in terms of general DM management including blood glucose control, blood pressure control, lipids control, smoking cessation, and foot care management including daily foot examination, foot hygiene, foot moisture, toenail care, proper footwear, foot injury preventio/ foot injury care. Diabetic foot care knowledge was measured by the Modified Foot Care Knowledge Questionnaire in the Indonesian language which was originally developed from Prior Foot Care Knowledge Questionnaire by Kurniawan, Sae-Sia, Maneewat, and Petpichetchian (2011). The higher scores represented better diabetic foot care knowledge.

Diabetic foot care behaviors (DFCB). DFCB referred to a self-report of activity done by the diabetic participants to maintain healthy feet in terms of general diabetic management including checking and recording blood glucose level regularly, checking and recording blood pressure regularly, regular exercise, stop smoking habit, and foot care management including daily foot assessment, maintaining foot hygiene, maintaining foot moisture, trimming toenails properly, selecting proper footwear, avoiding any potential foot-damaging activities, taking care any foot injury properly. DFCB was measured by the Modified Diabetic Foot Care Behaviors questionnaire which was originally developed from Diabetic Foot Care Behaviors questionnaire by Kurniawan et al. (2011) in the Indonesian language. The higher scores indicated better diabetic foot care behaviors.

Standard care program. A standard care program referred to care provided by nurses in the public health centers in Bojonegoro District. Standard care consists of a monthly regular check-up, medication and consultation, physical examination, and

blood glucose examination. There is no scheduled educational program. The education provided includes diet, exercise, and medication. A booklet related to general DM is the only tool to provide education. Foot care education as a specific topic is provided only if the patients complain of foot complications, signs, and symptoms.

Scope of the Study

This study was conducted to measure the effect of an FC camp on enhancing diabetes foot care knowledge and behaviors in adults with DM in Bojonegoro District, East Java, Indonesia. The participants were recruited in two public health centers from December 2016 to January 2017.

Significance of the Study

The findings of this study could contribute to nursing practice and the development of further research in the Indonesian nursing profession. In terms of nursing practice, the findings of this study were useful for a DFU prevention program in adult patients with DM. The diabetic foot care knowledge and behaviors gained from the FC camp activities could reduce the incidence of diabetic foot ulcer leading to reducing amputation especially in Bojonegoro, East Java, Indonesia.

Chapter 2

Literature Review

This chapter presents the literature reviews regarding diabetic foot ulcer, prevention of DFU, DFU prevention strategies and summary.

1. Diabetic Foot Ulcer
    - 1.1 Diagnosis and classification
    - 1.2 Risk factors of DFU
    - 1.3 Pathogenesis of DFU
2. Prevention of DFU
    - 2.1 Assessment of DFU risks
    - 2.2 Management of high-risk factors
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3. DFU Prevention Strategies
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4. Summary

Diabetic Foot Ulcer

This section includes diagnosis, classification, characteristics, risk factors, and pathogenesis of diabetic foot ulcer.

Diagnosis and classification. Diabetic foot ulcer is a delayed healing or non-healing wound (Alexiadou & Doupis, 2012; Jeffcoate & Harding, 2003), which is usually located at the bottom of the foot and occurs in patients with diabetic conditions (Jeffcoate & Harding, 2003). The diagnosis of DFU is derived from history and physical examination, ulcer examination, neurological testing, laboratory investigation, imaging, and data gathered from other investigations, such as an ultrasound test, pulse oximetry and foot peak plantar pressure measurement (Singh, Pai, & Yuhhui, 2013).

For the history, the assessment should include the symptoms of peripheral vascular disease (PVD) and neuropathy, previous ulcer, duration of DM and any other complication such us retinopathy and nephropathy. The aim of the history taking is to determine the severity and risk of foot ulceration.

In foot examinations, the healthcare providers should inspect the ulceration, foot temperature change, capillary refill time, deformities, dry skin, fissures, callosities, prominent veins, and nail lesion. Moreover, during an examination, patients may complain of pain, redness, and swelling. For the ulcer examination, the examiners assess the depth, size, location, shape, margins, and base of the ulcer to determine the depth and the presence of sinus tracts. Neurological testing is used to predict the risk of ulceration and amputation. In order to identify infection, laboratory investigations that include blood count, blood urea, creatinine levels, and electrolytes can be provided for appropriate objective data (Singh et al., 2013).

In order to classify DFU, the Wegner classification is commonly used among various classification systems. The purpose of the Wagner classification system is to assess the depth of the ulcer and the presence of gangrene or osteomyelitis. This tool consists of a 0-5 linear grading including (1) Grade 0 (pre-or postulcerative lesion), (2) grade 1 (partial/full thickness ulcer), (3) grade 2 (probing to tendon or capsule), (4) grade 3 (deep with osteitis), (5) grade 4 (partial foot gangrene), and (6) grade 5 (whole foot gangrene). The Wagner classification system is easy to apply and reliable; therefore, it has become the most popular classification system.

Risks factors of DFU. Previous studies found that the risk factors of DFU development are (1) age (Armstrong, 2007; Monami, 2009; Shahi, Kumar, Kumar, & Singh, 2012), (2) duration of DM (Sashi et al., 2012), (3) poor glycemic control (Dubský, 2013), (4) nicotine use (Merza & Tesfaye, 2003; Sashi et al., 2012), and (5) diabetic foot care knowledge and practice (Muhammad-Lutfi, Zaraihah, & Anuar-Ramdhan, 2014; Monami et al., 2015; Seid & Tsige, 2015).

Age. Studies regarding age and its association with DFU have been widely conducted. However, the results are somewhat contradictory. Three studies regarding age showed an association with DFU development (Armstrong, 2007; Monami, 2009; Shahi et al., 2012). Shahi et al., (2012) and Monami (2009) verified that the older age group was at a higher risk to develop DFU more than the younger age group, because the elderly were less mobile, had decreased vision ability, had other underlying diseases, and lived alone. On the contrary, Armstrong (2007) confirmed the opposite that younger people were at a higher risk. However, there is no scientific reason for the development of DFU in younger population in that study.

Duration of DM. The duration of DM is a strong predicting factor for DFU. It has been reported that patients with diabetes for a period of more than 8 years have a significant chance to develop DFU (Sashi et al., 2012). This condition is believed to be due to the development of peripheral neuropathy (PNP) and peripheral vascular disease (*PVD*) over time (Merza & Tesfaye, 2003).

Poor glycemic control. Poor management of glycemic control is one of the risk factors for ulceration. According to a systematic review, inadequate controlling blood sugar level can become the primary cause of DFU (Yazdanpanah et al., 2015). Inadequate blood sugar control can be proved based on laboratory data of the HbA1c level. Another study mentioned patients with HbA1c levels > 7.5% were prone to develop DFU (Dubský, 2013).This is due to the prolonged poor glycemic control that interrupts the wound healing process.

Nicotine use. In a study by Shahi et al. (2012), patients who had the habit of smoking did not correlate with the development of DFU. Cigarette use was not directly correlated with DFU but it was a strong factor for PVD (peripheral vascular disease) (Merza & Tesfaye, 2003). However, the habit of tobacco chewing was a direct risk factor for DFU presence (Shahi et al., 2012).

Diabetic foot care knowledge and practice. Regarding the knowledge and practice of diabetic foot care, some studies proved that better knowledge and practice determined the outcome of foot complications (Muhammad-Lutfi et al., 2014; Seid & Tsige, 2015). Adequate knowledge and practice regarding diabetic foot care will reduce the development of diabetic foot complications, particularly foot ulcer (Muhammad-Lutfi et al., 2014). Moreover, good diabetic foot care knowledge was linked to proper diabetic foot care practice. Diabetic patients with proper practices

have the capabilities to prevent or at least minimize the impacts of DFU through their abilities to determine early on any foot abnormalities. These capabilities will guide them to take early and proper action regarding foot ulcer prevention. Accordingly, programs enhancing knowledge and practice regarding diabetic foot care, such as an education program, showed a significant difference between the control group and the experimental group in terms of reducing the incidence of foot ulceration (Monami et al., 2015).

Pathogenesis of diabetic foot ulcer. The most common underlying etiologies of DFU are neuropathy, ischemia (Bowering, 2001; Jeffcoate & Harding, 2003), and neuro ischemia (Ndip & Jude, 2009). All of the underlying factors in DFU begin with chronic hyperglycemia which is a result of diabetes mellitus. Hyperglycemia induces metabolic abnormities and it is believed to be the underlying mechanism of neuropathies and ischemia (Bowering, 2001).

Neuropathy. Loss of neural supplies in intrinsic muscles induces motoric neuropathies. Imbalanced long flexor and extension tendons within a tendon lead to a contraction of the flexor tendon more powerful than the extensor tendon of the lower limbs. Therefore, that condition results in a high arched foot and claw deformity. Furthermore, muscle imbalance leads to an overriding of the metatarsal-phalangeal joints which force the metatarsal head downward and causes hyperextension of the toes resulting in increased plantar prominence. All of these mechanical changes cause increased plantar pressure which brings about the rendering of callus formation and underlying skin breakdown (Bowering, 2001).

The frequent friction of the foot with shoes also causes skin break. This condition happens because the foot size is not the same as the previous condition. A

wider and thicker foot more than normal results in an abnormal bony relationship and ill-fitting shoes cause local trauma in the foot (Bowering, 2001).

Moreover, a lack of neural supplies induces sensory neuropathies. Normally patients with a fissure or abnormal bony relationship will feel pain or discomfort. But the loss of senses of pain, heat, and pressure in the lower extremities creates diminished foot security (Fard, Esmaelzadeh, & Larijani, 2007). Impaired sensory of the foot causes a lack of awareness while walking and it also leads to a loss of protective sensation that can result in an actual wound (Jeffcoate & Harding, 2003).

In addition, the autonomic neuropathy pathway also can contribute to impaired skin integrity. Autonomic dysfunction leads to vasodilatation and loss of sweat in the lower limb (Fard et al., 2007). Anhidrosis causes the skin to become dry and prone to bacterial invasion. Moreover, peripheral edema can develop because of increased distal arterial flow and pressure due to a loss of peripheral sympathetic vascular tone in the lower limbs.

Ischemia. Reduced distribution of blood in a particular area, especially in the area of the foot because of arteriolar-venular shunting, leads to tissue ischemia. Tissue ischemia can also happen because of atherosclerosis. Tissue ischemia creates microvascular disease in the function (vasomotor neuropathy with defective microcirculation and abnormal endothelial function) and structure of the arteries (thickened basement membrane, capillary wall fragility, and thrombosis) (Jeffcoate & Harding, 2003).

***Neuro-ischemia*.** Hyperglycemia can damage nerves and it impacts the sensory and motor functions (Alexiadou & Doupis, 2012; Jeffcoate & Harding, 2003). Motor neuropathy affects normal walking movement and coordination and it causes

reactive callus at inappropriate sites. Moreover, a lack of oxygen supply also results in ischemia in tissues. Ischemia and callus formation lead to the breakdown of the skin and a neuropathic ulcer develops (Jeffcoate & Harding, 2003). In addition, a decreased oxygen supply is related to prolonged wound healing of the tissues and the potential development of infection. Infection and inadequate blood supply can also lead to further complications and ultimately to amputation.

Prevention of Diabetic Foot Ulcer

Based on foot care standards and practice guidelines, diabetic foot ulcer prevention must consist of 3 components: assessment of DFU risks; management of high-risk conditions; and risk appropriate foot care education (ADA, 2004; Canadian Diabetes Association, 2013; Indian Health Diabetes Best Practice Foot Care, 2011).

Assessment of DFU risks. Foot ulcer risk assessment aims for early recognition of the independent risk factors of diabetic foot ulcer. Early assessment is essential in order to prevent clinical diabetic foot complications. A routine foot examination in patients with high-risk diabetic foot is a necessary action to optimize the outcomes of a prevention strategy. According to Narayan et al. (2006), foot assessment consists of the three most feasible and cost-saving interventions in diabetic patients. A foot examination consists of all data related to DFU.

The assessment ten-gram monofilament is a test for protective sensation. This kind of examination is applied to the metatarsal head of each foot and on the first, third, and fifth digits of the plantar foot. Patients will show at high-risk of developing foot ulcer if they have no sensation on one or more tested sites. Accordingly, the ADA suggests supplementing the ten-gram monofilament test with at least one other

test including the ankle reflex, pin prick and/or proprioception, and vibration perception threshold or a 128 Hz tuning fork. Other assessments are inspecting for foot deformities and any altered biomechanics including Charcot foot, bony prominences, bunions, hammer or claw toe deformities, and excessive pronation or supination. Also, it is necessary to conduct a vascular examination on each foot by feeling for a pulse at the posterior tibial and dorsalis pedis arteries. Commonly, an audible assessment or assessing the ankle-brachial index (ABI) can be helpful in determining the pulse location if a pulse is not palpable.

Management of high-risk factors. According to a previous study, diabetic peripheral neuropathy is one of the predicting factors that contribute to the development of DFU. This section includes the management of diabetic peripheral neuropathy.

Management of diabetic peripheral neuropathy (DPN). Accordingly, more than 50 % of diabetic patients suffer from DPN, which causes morbidity and mortality. Painful neuropathic symptoms and insensitivity become the most frequent symptoms in DPN that increase the risk of injuries, burns, and DFU (Tesfaye & Selvarajah, 2012). Relief from the symptoms and a decrease in the underlying pathogenesis are essential to manage DPN.

Current management of DPN focuses on glycemic control and symptomatic pain relief. According to painful diabetic peripheral neuropathy treatment guidelines, pharmacological therapy using analgesics is the most often recommended treatment. By using the proper analgesia, patients can achieve pain reduction and improved quality of life. Another DPN management is glycemic control. Glycemic control is the essential approach to decrease the underlying pathogenesis mechanism. Glycemic

control slows the progression and delays the development of DPN in patients with DM type 2. Also, some supplementary pathogenesis treatments including protein kinase C_{β} inhibitor ruboxistaurin, vasodilators, and aldose reductase inhibitors have indeed provided promising results in ongoing clinical trials (Miranda-Massari, Gonzalez, Jimenez, Allende-Vigo, & Duconge, 2011).

Risk-appropriate foot care education. Foot care education among patients with diabetes depends on the type of education provided. Structural program education such as group-based education program and face to face educational program are combining the concept of health education, self-management, and self-care practices (Fan et al., 2013; Kurniawan et al., 2011; Monami et al., 2015). The structural educational programs are related with substantial increases in the numbers of patients conducting self- care management, daily examining their feet, using appropriate footwear, having proper toenail care, and having professional assessments of their feet (McInnes et al., 2011). In addition, foot care education has been proved enhancing foot care knowledge and behaviors in DM patients with risk of developing DFU (Fan et al. 2013; Kurniawan et al., 2011; Monami et al., 2015).

DFU Prevention Strategies

Several programs designed to enhance the knowledge and behaviors proved to be significantly effective in increasing a patient's knowledge and behaviors regarding diabetic foot care. However, the effectiveness and efficiency should be continuously evaluated. This DFU prevention strategies section explained the evaluation of program enhancing diabetic foot care knowledge and behaviors including diabetic foot care knowledge and behaviors improvement program, contributing factors of

diabetic foot care, the concept of camp and assessment of diabetic foot care knowledge and behaviors.

Diabetic foot care knowledge and behavior improvement program. Based on literature reviews, there were 6 studies (4 RCTs and 2 quasi-experimental studies) that evaluated the effectiveness of a diabetic foot care program in order to improve diabetic foot care knowledge and behaviors. According to these reviews, the clinical characteristics became the main outcomes followed by the secondary outcomes that were knowledge and behaviors (Beiranvand, Fayazi, & Asadizaker, 2015; Monami et al., 2015; Pérez-Borges et al., 2015). Adequate knowledge was deemed to be important to prevent DFU because it became the basis to enhance self-care behavior (Fan et al., 2013). Another study mentioned that knowledge and behaviors were essential in DFU prevention (Rocha, Zanetti, & Santos, 2009).

Most of the studies in the literature reviews provided educational programs through group-based interaction (5-10 participants each group) (Beiranvand et al., 2015; Monami et al., 2015; Pérez-Borges et al., 2015; Rygg et al., 2012), while other studies used the individual/face-to-face educational approach (Fan et al., 2013; Kurniawan et al., 2011) (Table 1). In comparison, both group-based and individual or face-to-face educational programs seemed equal according to the effectiveness of the strategies. Another study stated that a group-based educational study provided other benefits regarding cost and time. Moreover, it resulted in better care and outcomes due to the opportunity to share problems with similarly affected participants in addition to the education (Hwee, Cauch-Dudek, Victor, & Shah, 2014).

Strategies used in diabetic foot care programs were education regarding foot ulcer care, practical foot care exercises through demonstration, counseling on foot

self-care concerns, and motivational sessions (Beiranvand et al., 2015; Fan et al., 2013; Kurniawan et al., 2011; Monami et al., 2015; Pérez-Borges et al., 2015; Rygg et al., 2012). Based on the reviews, there were two studies that provided only an educational session and demonstration (Monami et al., 2015; Pérez-Borges et al., 2015). Those studies proved to have significantly enhanced the knowledge regarding foot ulcer prevention but did not show changes in behaviors as evidenced by no differences in body mass index (BMI) or HbA1c. This evidence showed that patients with adequate knowledge regarding DFU prevention did not always translate their knowledge into self-care actions. One study suggested that socialization among patients while conducting the education program, should be taken into consideration (Rocha et al., 2009). According to this evidence, only one study provided long breaks for participants to socialize with each other (Rygg et al., 2012). Several studies mentioned that education (Choi, Song, Chang, & Kim, 2014), motivation (Brewer-Lowry, Arcury, Bell, & Quandt, 2010; Choi, Song, Chang, & Kim, 2014), and social support (Akca & Cinar, 2008; Hunt, Grant, Pryor, Moneyham, Wilder, & Steele, 2012) proved to enhance knowledge and behaviors.

Regarding the educational content of a foot care program, two studies developed their foot care program from guidelines purposed by the Registered Nurses' Association of Ontario (Fan et al. 2013), the Indian Health Diabetes Best Practice Foot Care, and the Registered Nurses' Association of Ontario (Kurniawan et al., 2011). The main contents of the guidelines consisted of general diabetes management (controlling blood glucose, controlling blood pressure, controlling lipids, and smoking cessation), regular foot assessment, daily foot hygiene, prevention of

potentially damaging activities, proper footwear, proper nail and callus care, and foot moisturizing.

All studies used follow-up strategies to maintain intervention (Table 1). The content of follow-up counseling included assessing the participants' foot self-care concerns, assessing foot self-care on a daily basis, giving reinforcement based on achievements, and remembering the foot self-care strategies and next follow-up (Fan et al., 2013; Kurniawan et al., 2011). However, some studies did not mention in detail the content of the follow-up strategies. The strategies used in those studies included a telephone call and follow-up as scheduled in a clinic. One study reported that some participants did not attend the clinic for the scheduled follow-up appointments that were made by the researchers (Monami et al., 2015). However, one systematic review reported that a telephone call was effective and feasible to assess knowledge, discuss the patients' concerns, and encourage lifestyle and behavioral changes (Furuya et al., 2013).

Based on the reviews, the duration of the studies varied from 2 hours (Monami et al., 2015) to 5 weeks (Kurniawan et al., 2011). The periods of outcome measurements of the studies were assessed at 5 weeks (Kurniawan et al., 2011), 3 months (Fan et al. 2013), and 6 or 12 months (Monami et al., 2015; Pérez-Borges et al., 2015; Rygg et al., 2012). The diabetic foot care program implementation time also varied from 115 minutes (Pérez-Borges et al., 2015) to 900 minutes (Rygg et al., 2012). Even though a brief or short educational session was effective to enhance knowledge, the context of enhancing behaviors remained ineffective (Monami et al., 2015). One systematic review suggested that the educational program, which

consisted of more interaction between participants and health care provider, was more effective than a brief session in a foot care prevention program (Bazian Ltd., 2005).

According to the research methodology of the studies, there were some issues that might have impacted the validity of those studies that included (1) did not perform randomization (Fan et al. 2013; Kurniawan et al., 2011), (2) did not measure baseline diabetic foot ulcer prevention knowledge (Pérez-Borges et al., 2015), (3) did not measure components of desired foot care (Monami et al., 2015) and (4) did not explain standard care in the control group (Fan et al. 2013). A systematic review reported that usually, trials in enhancing foot care knowledge and behaviors had methodological flaws due to not performing a true randomization and had overestimated the effect sizes. Therefore, some positive outcomes should be interpreted with caution (Dorresteijn & Valk, 2012). One systematic review suggested that using a matched-control design on age, gender, duration of diabetes, and method of insulin delivery among the experimental and control groups seemed to be useful to determine the effectiveness of the program (McAuliffe-Fogarty et al., 2007).

The outcomes of the studies were DFU prevention knowledge, DFU prevention behaviors, the incidence of foot ulcer, and clinical data regarding DM. Patients who received foot ulcer programs showed better knowledge (Beiranvand et al., 2015; Fan et al., 2013; Kurniawan et al., 2011; Monami et al., 2015; Pérez-Borges et al., 2015; Rygg et al., 2012), behaviors (Fan et al., 2013; Kurniawan et al., 2011), and reduced development of DFU (Monami et al., 2015; Pérez-Borges et al., 2015). However, some studies did not show any significant differences in BMI, HbA1c, smoking cessation, or total cholesterol (Pérez-Borges et al., 2015).

Table 1. General Information of Studies Reviewed

No	Authors (year)	Country	Study design		Setting		Mode		Methods							Educator		Follow-up method		Duration		Material		Outcome				
			RCT	Quasi	Inpatient	Outpatient	Group	Individual	Education	Demonstration	Counseling	Motivational	Socializing	Leaflet / Booklet	Video	Clinical / trainer	Multidiscipline	Telephone	When patients check-up	< 1 week	1 weeks and more	Guideline	Unexplained	Knowledge	Behavior	Skill	Incident of foot ulcer	Clinical data
1	Kurniawan et al. (2011)	Indonesia		✓		✓		✓	✓		✓	✓		✓	✓	✓		✓		✓		✓		✓	✓			
2	Fan et al. (2013)	USA		✓		✓		✓	✓	✓	✓	✓				✓		✓		✓		✓		✓	✓			
3	Pérez-Borges et al. (2015)	Spain	✓		✓		✓		✓	✓						✓					✓		✓	✓		✓	✓	✓
4	Rygg et al. (2012)	Norway	✓		✓		✓		✓				✓				✓		✓		✓		✓	✓	✓			✓
5	Monami et al. (2015)	Norway	✓			✓	✓		✓	✓				✓			✓		✓	✓		✓		✓			✓	✓
6	Beiranvand et al. (2015)	Iran	✓			✓	✓		✓	✓			✓	✓		✓				✓			✓	✓		✓		

Contributing factors of diabetic foot care. This section includes contributing factors of diabetic foot care knowledge and contributing factors of diabetic foot care behaviors.

***Contributing factors of diabetic foot care knowledge*.** Several studies revealed that level of knowledge becomes the basis of the patients' foot care management. However, diabetic foot care knowledge is influenced by several factors.

The level of education. Based on literature reviews, there is an association between level of education and level of knowledge regarding foot care prevention. The study of Chellan et al. (2012) proved that participants who graduated from high school have lower foot care knowledge than those who graduated from bachelor degree. Moreover, in this study also revealed that participants who have a higher level of education showed a low incidence of DFU. In addition, the patients' level of education has been positively influencing diabetic foot care knowledge, which implies to reduce the development of DFU (Desalu, Salawu, Jimoh, Adekoya, Busari, & Olokoba, 2011). The correlation between the level of education and diabetic foot care knowledge may be due to that fact that educated patients were able to understand the content of the educational program and were able to read and understand supportive educational material that given to them.

Socioeconomic status. Based on Desalu et al. (2011), patients who had poor socioeconomic status had significantly lower diabetic foot care knowledge than those who had good socioeconomic status. Another study mentioned, the majority of patients who came from poor socioeconomic background has limited access to health education and lacked health insurance that was contributed to inadequate preventive knowledge regarding foot care (Lamchahab, El Kihal, Khoudri, Chraibi, Hassam, &

Ourhroui, 2011). This socioeconomic barrier may be due to the fact that patients who had poor social and economic status fear to access the educational program from health care providers because of financial constraints.

Patient's characteristics. There were several patient characteristics that influence diabetic foot care knowledge. Desalu et al., (2011) revealed that diabetic foot care knowledge can be influenced by patients' age. Older patients were found to be associated with less knowledgeable of foot care, although this correlation was not statistically significant. Other patient characteristics that included socio-cultural belief, gender (Desalu et al., 2011), and awareness (Lamchahab et al., 2011).

Contributing factors of diabetic foot care behaviors. Diabetic foot care behaviors in patients with diabetes are influenced by several factors.

Patient knowledge. The development of DFU has been related to poor knowledge regarding foot care and foot self-care skills (Jordan & Jordan, 2011). This lack of knowledge has been recognized as a barrier for patients with diabetes in performing adequate foot self-care practice (Harvey & Lawson, 2009). It has been proved that an educational program would lead to improve knowledge and behaviors regarding diabetic foot care (Kurniwan, 2011). Therefore, studies showed that a diabetic foot care educational program was essential in enhancing diabetic foot care knowledge and self-care behaviors (Fan et al., 2013; Kurniawan et al., 2011).

Patient's characteristics. There were several patient characteristics that influenced diabetic foot care behaviors. According to Vedhara et al., (2014), age is one patient characteristic that influences diabetic foot care behavior. Younger age was found to be strongly associated with greater foot care practice. Other patient characteristics that were associated with foot care behaviors were gender (Salmani &

Hosseini, 2010), beliefs (Vedhara et al., 2014), and educational level (Khamseh et al., 2007).

Diabetes mellitus complications. Several complications of diabetes mellitus may trigger an increased awareness in patients to implement diabetic foot care. However, some complications may interrupt patients in performing daily foot care. One study reported that vision problems were reported as a barrier while conducting foot self-care (Olson, Hogan, Pogach, Rajan, Raugi, & Reiber, 2009). Retinopathy of diabetic patients affected their ability to properly assess and perform foot care and they needed assistance from a caregiver to help them implement diabetic foot care.

The concept of a camp. The American Camp Association (ACA) reported that a camp was the greatest approach for patients to experience socializing, humanizing, and civilizing factors that can enter into the lives of men and women. It was estimated by the ACA that each year around 10 to 12 million individuals attend a camp in the USA (Barr et al., 2010). Nowadays, specialized camps have been created for individuals with diabetes, HIV/Aids, kidney diseases, and other chronic illnesses. Beljic (2007) conducted specialized purposes camp in elderly diabetic population. The aim of that study was to help participants to enhance knowledge and skills, socialize with others, and become more active. This study integrated the concepts of motivating, learning and socializing. The motivating concept defined as the strategy used to engage intrinsic motivation for the diabetic patient in order to change behaviors. Beljic (2007) mentioned that diabetic patients can get motivation by trainer and peers. The learning concept defined as the structured educational program provided in form of group-based educational program to enhance people management skills, practices, and to share knowledge in open and unthreatening environment

(Beljic, 2007). The socializing concept defined as an activity that let people with diabetes to meet and gating together among similarly affected people in one organized program (Beljic, 2007). The purpose of socializing concept was to enhance people with DM's confidence in the daily foot care practice. Even though the concept of camp purposed by Beljic (2007) was mentioned, there was a lack of guidelines to organize that camp. Therefore, this section describes the organization of a camp based on literature reviews.

Duration of a camp. The duration of a camp varies from 2 (Barr et al., 2010) to 8 days (Békési et al., 2011) (Table 2). Some studies provided overnight stay camps which allowed researchers to control the behaviors of the participants regarding diabetic management (Békési et al., 2011; Chaichanwattanakull et al., 2012). Based on guidelines for conducting camp activities in a less-resourced country, a camp could be conducted in a half day activity, one day camp, 2-day camp without an overnight stay, or a 3-5 day residential camp (Middlehurst, Ogle, Ackley, & Yeager, 2016). However, in the guideline provided no evidence of comparison of the effectiveness between each duration of camp.

***Time of measuring the outcomes*.** Measurements of the outcomes and questionnaires varied from 2 months prior to camp (Békési et al., 2011) to 12 months after camp (Chaichanwattanakull et al., 2012). Out of four studies, two of the studies repeated the administration of a questionnaire in several months after gathered the first outcome (Chaichanwattanakull et al., 2012; Mercuri et al., 2009). Based on the reviews, the questionnaire of knowledge was administered before camp, immediately after camp, and during a follow-up session (Chaichanwattanakull et al., 2012; Mercuri et al., 2009). The behaviors were measured prior to camp and during a follow-up

session (Chaichanwattanakull et al., 2012). Based on Fan et al. (2013), the time period between the intervention and follow-up session provided space for researchers to maintain participants behaviors. However, some studies did not clearly mention the time of examining the outcomes (Barr et al., 2010; Békési et al., 2011).

Camp activities. The programs provided in a camp were usually educational and recreational activities (Barr et al., 2010; Békési et al., 2011; Chaichanwattanakull et al., 2012; Mercuri et al., 2009). Some studies provided educational sessions through group-based learning activities that included tutoring, discussions, and problem-solving (Barr et al., 2010; Chaichanwattanakull et al., 2012; Mercuri et al., 2009). In group educational sessions, a case scenario regarding diabetic control was given to the participants and they were free to discuss and to resolve the problems together (Chaichanwattanakull et al., 2012; Mercuri et al., 2009). The purpose of the educational session was to reinforce the diabetes learning process and motivate the participants to enhance implementation of their knowledge (Mercuri et al., 2009). In addition, the recreational activities provided in camp included mostly sports, team games, and dancing (Barr et al., 2010; Békési et al., 2011; Chaichanwattanakull et al., 2012; Mercuri et al., 2009). Recreational or fun activities let the participants meet, socialize, and make friends in a safe environment (Middlehurst et al., 2016). The camp program also included meal times. The researcher provided time for the participants to learn types of diabetic diets and self-monitoring of blood glucose during their meals (Mercuri et al., 2009). For safety concerns, a dietician who was experienced in diabetes management was consulted to plan the menu (Middlehurst et al., 2016).

***Organized team*.** From the camp reviews, the organization of a camp was led by multidiscipline practitioners that included a physician, nurse, and nutritionist (Chaichanwattanakull et al., 2012; Mercuri et al., 2009) (Table 2). Of the four studies, two studies did not clearly mention who ran the camp (Barr et al., 2010; Békési et al., 2011). Since DFU prevention needs certain basic knowledge regarding diabetic medication, foot care, and diet, the multidisciplinary team needs to cover all of the needs that exist. In terms of team responsibility, the study conducted by Chaichanwattanakull et al. (2012) mentioned the role of each team in the camp. The physicians and nurses have the responsibility to provide educational sessions regarding the relationship between activities, insulin, food intake, and blood glucose level. The dietician is responsible for providing the meals adjusted for DM patients (Chaichanwattanakull et al., 2012). To provide a medically safe environment during the camp, the staff-to-participant ratio must be appropriate for the number of participants. Based on IDF (2016), the number of staff members or health practitioners must be sufficient for the number of participants in the camp for safety reasons. The guideline for conducting a camp in a developing country mentioned that there should be at least one staff member to cover ten to twelve participants in the camp (Middlehurst et al., 2016). In order to supervise and administer care to participants during the camp, staff members in the camp are supposed to be licensed health practitioners (RN or MD) preferably over 25 years old who are knowledgeable in diabetes management (Middlehurst et al., 2016).

***Outcomes of a camp*.** From the literature reviews, the outcome variables of a camp were knowledge, behaviors (Chaichanwattanakull et al., 2012; Mercuri et al., 2009), skills (Mercuri et al., 2009), quality of life (Békési et al., 2011;

Chaichanwattanakull et al., 2012), and clinical data that included blood glucose level and HbA1c (Chaichanwattanakull et al., 2012) (Table 2). Since the camp provided educational sessions during the program, the camp proved to enhance knowledge (Chaichanwattanakull et al., 2012; Mercuri et al., 2009) and skills (Mercuri et al., 2009) among the participants. However, some studies reported that there were no significant differences in the outcomes between the control and experimental groups. The study of a DM camp by Chaichanwattanakull et al. (2012) did not show improvement in the quality of life or improvement in the clinical data regarding HbA1c in the diabetic population. Moreover, a study in a critically ill camp conducted by Békési et al. (2011) reported no differences in the quality of life between the control and experimental groups. Therefore, the guidelines for conducting a camp that included the duration of the camp, activities, and the education strategy used during the camp should be standardized to minimize the inconsistency of the camp outcomes.

Table 2. General Information of Camp Reviews

No	Authors (year)	Type of Illness	Study design		Setting		Methods						Educator		Follow-up strategies		Duration		Concept of studies	Outcomes			
			RCT	Quasi	Inpatient	Outpatient	Education	Demonstration	Recreational	Motivational	Social activities	Exercise	Clinical / trainer	Multidiscipline	Not mentions	When patients check-up	< 7 days	7 days and more	Unexplained	Knowledge	Behaviors	Skill	Others
1	Chaichanwattanakull et al. (2012)	DM type 2		✓	✓		✓	✓		✓	✓			✓		✓	✓		✓	✓	✓		✓
2	Barr et al. (2010)	Cancer	✓			✓	✓		✓	✓			✓			✓	✓		✓		✓		
3	Békési et al. (2011)	Oncology, Diabetes Mellitus and juvenile idiopathic arthritis		✓		✓	✓		✓			✓			✓			✓	✓				✓
4	Mercuri et al. (2009)	DM type 1		✓		✓	✓		✓			✓		✓	✓			✓	✓	✓	✓	✓	

Diabetic foot care knowledge and behaviors assessment. According to the literature reviews, the knowledge and behaviors assessment usually measured by separate tools. However, some tools cover the dimension of knowledge and behaviors together in one questionnaire. There were four diabetic foot care knowledge and behaviors questionnaires that were the most common questionnaires: the Diabetic Foot Care Prior Knowledge Questionnaire (DFCPK); the Diabetes Foot Self-Care Behaviors Scale (DFSBS); the Nottingham Assessment of Functional Foot-care Questionnaire and DisFoKaPS-32 Questionnaire (Table 3).

Diabetic Foot Care Prior Knowledge Questionnaire (DFCPK). The DFCPK was originally developed by Kurniawan et al. (2011) based on guidelines and existing knowledge regarding foot care. Historically, this tool was used to capture the prior foot care prevention knowledge among DM patients to guide the researcher to determine individual-based educational intervention. This questionnaire consisted of dichotomous true/false simple questions. Accordingly, this questionnaire consisted of 5 dimensions including foot injury prevention, foot assessment, foot hygiene, footwear, and toenail care.

Kurniawan et al. (2011) developed the Diabetic Foot Care Behaviors Questionnaire that originally derived from NAFF (Lincoln & colleagues, 2007). To achieve the best fit with cultural sensitivity, this questionnaire added and modified with several items from original questionnaire. Some items such as measuring water temperature with a thermometer, warming the foot near a fire or using core remedies did not fit with Indonesian culture. The content validity of the diabetic foot care behaviors questionnaire version was validated by three experts. All of the experts

came to a general agreement on the instrument items following cultural concerns. The reliability test showed a Cronbach's alpha of .72.

Diabetes Foot Self-Care Behaviors Scale (DFSBS). DFSBS was developed by Chin & Huang (2013) based on guidelines and existing foot self-care behaviors. This tool was used to measure foot self-care behaviors that include daily foot care routines. DFSBS can be used not only for patients who have basic knowledge of foot self-care education but also for patients who have not received foot care education. It originally consisted of seven items on the examination of the bottom of feet and between toes, toes care, dry toes after washing, moisturized feet, and checking footwear. The known-groups validity was statistically significantly different between the DFSBS scale in patients with and without a history of foot ulcer ($p <$ .01). The Cronbach's alpha was reported as .73 for the seven-item scale.

Nottingham Assessment Of Functional Foot-Care Questionnaire (NAFF). The NAFF measures foot-care behaviors. This instrument was originally developed by Lincoln and colleagues (2007) and consisted of 29 items. Accordingly, a revised questionnaire consisted of 6 items including foot assessment, footwear, foot hygiene, foot injury prevention, toenail care, and wound care. However, since this instrument was developed and utilized in a western context, the particular context and culture might be different in other regions; therefore, some items need to be modified to fit other contexts.

DisFoKaPS-32 questionnaire. Khamseh et al. (2007) developed this tool based on foot care principles. It is a composite of 16 items on knowledge and 16 items on behaviors. The contents of foot care items are comprised of self-assessment (4 questions), footwear (3 questions), foot hygiene (7 questions), and toenail care (2

questions). Even though there was no report regarding a reliability test, the content validity in Iranian diabetic patients was generally approved by five doctors and one nurse. The DisFoKaPS 32 questionnaire capture both the dimension of knowledge and behaviors. However, the DisFoKaPS 32 questionnaire not capture the foot injury prevention items, which is the important items in foot ulcer prevention knowledge. In comparison, DFCPK questionnaire captures the dimension of knowledge without the dimension of behaviors. However, this questionnaire provides a complete domain regarding foot care knowledge with includes foot injury prevention domain.

In a comparison of diabetic foot care behaviors questionnaire, the foot care components between the DFSBS, diabetic foot care behaviors questionnaire, and the DisFoKaPS 32 have some similarities regarding self-examination, foot hygiene, footwear, and toenail care. However, based on the Indian Health Diabetes Best Practice Foot Care (2011), basic knowledge regarding general diabetes management could influence the behaviors of DFU prevention. Moreover, there are some considerations regarding the culture and habits of certain populations. Some items may not fit the foot care knowledge and behaviors in some countries. Therefore, additional items regarding general diabetic management and cultural concerns should be considered.

Table 3. Diabetic Foot Care Behaviors Measurement Tools

No	Authors (year)	Tool	Country	Knowledge	Behaviors	Scale items						Number of items
						Foot assessment	Footwear	Foot hygiene	Foot injury	Toenail care	Moisturizing foot	
1.	Kurniawan et al. (2011)	DFCPK	Indonesia	✓		✓	✓	✓	✓	✓		10
2.	Chin & Huang (2013)	DSFBS	Taiwan		✓	✓	✓	✓			✓	7
3.	Kurniawan et al. (2011)	Modified NAFF	Indonesia		✓	✓	✓	✓	✓			29
4.	Lincoln et al. (2007)	NAFF	USA		✓	✓	✓	✓	✓			29
5.	Khamseh et al. (2007)	DisFoKaPS-32	Iran	✓	✓	✓	✓	✓		✓		16

DFCPK: Diabetic Foot Care Prior Knowledge Questionnaire; DSFBS: Diabetes Foot Self-Care Behaviors Scale; NAFF: Nottingham Assessment of Functional Foot-care Questionnaire

Diabetic foot care program in Indonesia. There were few accessible studies specifically regarding the evaluation of a diabetic foot care program in Indonesia. PROLANIS is one of the chronic disease management programs to enhance self-management of diabetes. This program aims to prevent complications of diabetes including DFU. The activities of this program include education, consultation, home visits, reminders, club activities, and health status monitoring. PROLANIS is one program that is promoted by the Indonesian National Health Insurance Program (BPJS) which serves all insured participants. However, access to the information and education for those who are not insured by BPJS seems to be unequal (Soewondo, Ferrario, & Tahapary, 2013).

In the context of purposed sites of a study, a nurse who works in public health care in the Bojonegoro District shared some information regarding standard care in one unit. The program conducted in this unit included a monthly check-up, blood glucose examination, physical examination, educational program, consultation, and medication. The physician conducts the regular check-up and prescribes the treatment, while the nurse has the responsibility to assess the vital signs and provide the education regarding diabetes. The education session is usually conducted by nursing students in a group-based educational method. The knowledge provided by the nurses in the educational program usually focuses on diet and exercise, while education related to diabetic foot care prevention is given by a physician. The education related to DFU prevention is only provided when patients present with foot abnormalities or complain of diabetic neuropathies. However, the specific tools to conduct a foot examination are not provided in this unit (Atik, personal communication, September 15, 2016).

Summary

Several studies revealed that the desired foot care and diabetic management behaviors were viewed as the main components to prevent diabetic foot ulcer. Accordingly, knowledge has long been assumed to be positively correlated with attitudes on behaviors. The DM patients have to be knowledgeable in DFU prevention such as DM general management and foot care. Not only knowledge itself, they have to translate their knowledge into adequate behaviors. The desired foot care behaviors that should be done by DM patients are daily foot assessment, maintaining foot hygiene, maintaining foot moisture, proper trimming of toenails, selecting proper footwear, avoiding any potential foot-damaging activities, and taking proper care of any foot injury. Since the knowledge and behaviors are assumed to be the main components to prevent DFU, several studies conducted programs to enhance the knowledge and behaviors.

Diabetic foot care knowledge and behaviors can be enhanced by several strategies including educational program (lecture session, practical session, group discussion, showing videos, and distributing a booklet), recreational activities (dancing, sport, and games), and telephone call sessions. Evidence-based results showed that an educational program could improve the knowledge of participants regarding DFU prevention. Several studies added weekly telephone sessions to maintain proper diabetic foot care behaviors of the participants. According to the reviews, brief telephone calls were used by some researchers to maintain the foot care behaviors of the participants. Another study provided different approaches such as recreational activities. Recreational activities provided the participants with meeting

and socializing experiences in a non-clinical atmosphere. However, there is no published study that combines all of the strategies mentioned above.

Evidence proved that a camp could improve the knowledge and behaviors of the participants. The camp is one approach that can be broadly used in chronically ill patients. Usually, the camp activities consist of learning sessions and recreational activities. This strategy provides education with an interactive learning. Therefore, besides receiving knowledge, the participants can get recreational experience and socialize with people suffering from the same disease. Based on the reviews, the camps were organized by multidisciplinary teams that included physicians, nurses, and dieticians who could cover the needs during the camp. The ratio between the team members and participants should be one health practitioner who is responsible for ten to twelve participants. This ratio can run the camp effectively and also provide a safe environment for the participants. However, there is a lack of published study which provides guidelines for conducting a DFU prevention camp.

Chapter 3

Research Methods

The research method consists of the research design, setting and population, sample, instrumentation, data collection procedures, ethical consideration, and data analysis.

Research Design

This study was a quasi-experimental design with two group pre and post-test design.

Setting and Population

This study was conducted in public health centers located in Bojonegoro district. There are 36 public health centers in Bojonegoro District. Two public health centers with largest DM populations were selected in order to get the required sample in this study. Two public health centers of Ngumpakdalem (870 cases) and Bojonegoro (2258 cases) were used in this study setting. In addition, regarding the generalizability of standard care among participants, both public health centers used the same guideline of standard care for DM complications prevention. Patients with DM in these two public health centers came to take monthly general check-up by the second week of the month. These public health centers are hiring physicians, nurses, and administrative staff as the staff and they all have their own duty and responsibility. The routine standard care includes monthly general check-up, vital sign examination, blood glucose examination, and monthly health education. The health

education is usually provided by physicians, nurses, and nursing students. The health education includes medication, exercise, and diabetic diet. Foot care education would be provided to patients when they complain about the sign of neuropathy, or if physicians, or nurses notices the foot abnormalities.

Sample

The sample of this study consisted of participants who met the inclusion criteria set by the researcher. The inclusion criteria includes (1) over 18 – 65 years old to minimize the common problem of the aging process that may impact the participants to perform independent daily activity; (2) diagnosed with diabetes mellitus by the physician; (3) be able to write, read, and hear Indonesian language; (4) be able to do daily activity independently; (5) no existing visual problem; (6) no existing hearing problem; and (7) could be contacted through telephone. Participants who developed signs of generally unwell feeling, such as nausea, vomiting or fever during two-day camp period excluded from this study as well as those who developed severe complications, such as diabetic joint problem, retinopathy and/or being hospitalized during a 5-week program.

Sample size calculation. The effect size of this study was based on the result of a previous study (Beiranvand, Fayazi, & Asadizaker, 2015). This study used interventions in its educational program namely lecture, group discussion, answering the question, practice session, and providing booklet. Those interventions were similar to the program used in this study. Moreover, the measured outcomes of that study were also similar to this current study. Thus, the effect size of this current study was calculated by mean and standard deviation of knowledge variable of Beiranvand

et al., (2015) (Appendix H). According to Cohen (1988), the minimum sample size for the significant level of alpha at .05, the power of .80, and effect size of .60 was 35 participants per group or 70 participants in total. To prevent the attrition of participants, the researcher added 20 % of the total sample (Polit & Beck, 2012). Therefore, the sample size of each group was 42 with 84 in total. However, in the control group, the researcher got only 39 participants while 4 of them were dropped out due to not coming at scheduled posttest time. In the experimental group, 5 participants were dropped out due to not following all program in a five-week foot care camp. Therefore, the total participants who completed a five-week program were 72 participants consisted of 35 participants in the control group and 37 participants in the experimental group.

Sampling procedure. In order to minimize the interaction threat between participants in the control and experimental group, the sample of both groups was recruited from two different public health centers, the Bojonegoro and Ngumpakdalem public health centers. Both public health centers were randomly picked up as either experimental or control group by tossing a coin. Then, the researcher performed purposive sampling technique to gather the sample. The participants who met inclusion criteria were matched based on age ($\pm$ 5 years), gender, and level of education until sample size reached 42 participants per group. Then, the participants of the study were gathered at the scheduled time and place.

Instrumentation

The instruments used in this study were divided into two parts; foot care camp protocol and data collection instruments.

Foot care camp protocol. This study was conducted in the Ngumpakdalem public health center and the recreational place located in Bojonegoro district, East Java, Indonesia from December 2016 to February 2017. Foot Care (FC) camp consisted of several strategies that uphold the concepts of learning, socializing, and motivating. The learning concept was applied in the educational session of diabetic foot care knowledge, booklet, and diabetic foot care video. Then, the participants were guided into discussion session and received weekly brief consultation via a telephone call. The camp procedure was held within two days activities and 3 weeks follow-up session by the telephone call. The detail of the program of each week comprised the following activities.

The two-day interventions. The educational program of FC camp activities was provided in two days period. It consisted of a half-day of educational session for two days. In the first half-day activities, the researcher conducted several activities including (1) performing pre-test on diabetic foot care knowledge and behaviors, (2) one hour group-based educational session by lecture format and having them to watch diabetic foot care video (gathered from World Diabetic Foundation), and (3) discussion session according to questions arising within the group. After finishing the first two-day activities participants went home and the researcher made an appointment with the participants for the next day activities. In the second half-day program, the researcher provided several activities including (1) one-hour practice session regarding desired diabetic foot care behaviors, (2) discussion session according to DM experiences and potential barriers in implementing foot care, and (3) managing fun and recreational activities.

The given materials consisted of general the diabetic management, specific information regarding the desired DFCB, diabetic foot care components including daily foot assessment, maintaining foot hygiene, maintaining foot moisture, trimming toenails properly, selecting proper footwear, avoiding any potential foot-damaging activities, and taking care any foot injury properly. All of this information regarding diabetic foot care components were compiled in the booklet that was given to each participant (Appendix D).

The second, third, and fourth week interventions. During the 2nd, the 3rd, and the 4th week of this program, brief counseling via telephone call was conducted 1 time a week to assess participants' foot care concern, foot care on the daily basis, and to give reinforcement based on achievement. In the end of telephone call session, the researcher reminded the participants about foot self-care strategies and next follow-up call.

The fifth week intervention. In the last week of this program, all participants attended the monthly general check-up in the public health care. During this agenda, the researcher provided questionnaire regarding diabetic foot care behaviors and knowledge and asked them about obstacles in conducting diabetic foot care behaviors.

Data collection instruments. The data collection instruments consisted of demographic data questionnaire, diabetic foot knowledge questionnaire, and diabetic foot care behaviors questionnaire. The detail of each questionnaire was illustrated in the following section.

Demographic data questionnaire. This questionnaire was developed by the researcher in order to get demographic data of participants. Record form of personal information questionnaire consisted of multiple choice and dichotomous questions. It

consisted of five items demographic data including age, gender, marital status, level of education, and occupation. Nine items of general clinical information were included BMI, diabetes duration, latest blood glucose, co-morbid disease, smoking history, neuropathy sign, peripheral arterial disease sign, foot deformity, and history of foot ulcers (Appendix E). These data were collected by the researcher or research assistants.

Modified Diabetic Foot Care Knowledge Questionnaire **(MDFCK).** This questionnaire originally developed by Kurniawan, Sae-Sia, Maneewat, and Petpichetchian (2011) in the Indonesian language. The questions in this questionnaire were used to measure basic knowledge regarding foot care in the local of foot area. In original form, this questionnaire consisted of 10 items including preventing foot injuries (2 items), checking foot condition (2 items), foot hygiene (3 items), appropriate footwear (2 items), and toenail care (1 items). Each item was measured by using true/false question in which the "1" point for the correct answer and "0" point for the wrong answer. In order to obtain basic knowledge regarding general diabetic management, this tool was modified with five items to identify the domain of smoking cessation, glycemic control, blood pressure control and control lipid based on Indian Health Diabetes Best Practice Foot Care Guideline (2011) (Appendix F). That five additional domains of general DM management are evidential as risk factors of DFU development. Therefore, the modified versions consisted of 15 items. The higher total scores indicated better diabetic foot care knowledge.

Modified Diabetic Foot Care Behaviors Questionnaire **(MDFCB).** Diabetic foot care behaviors in this study was collected using MDFCB questionnaire in Indonesian version. This questionnaire originally developed by Kurniawan, Sae-Sia,

Maneewat, and Petpichetchian (2011). The original diabetic foot care behaviors was modified following the cultural sensitivity and acceptable language of Indonesia. The questionnaire consists of 30 items including checking foot condition (4 items), foot hygiene (4 items), appropriate footwear (11 items), foot moisturize (2), toenail care (5), foot injury prevention (1 items), and foot injuries treatment (3 items). Each item was measured using a (0-3) Likert scale in which the positive statement "0" represented "never practice" and "4" represented "always practice", and on the other hand, the negative statement applied the opposite scoring. The higher total score represented better DFCB. Statistically, this tool was reliable and valid as a measurement for DFCB (Kurniawan, Sae-Sia, Maneewat, & Petpichetchian, 2011).

Also, there were four items added to this tool to obtain participants' behaviors regarding smoking cessation, glycemic control, blood pressure control, and control lipid. Therefore, the total items of MDFCB questionnaire consisted of 34 items. For modification process, the researcher used several guidelines regarding diabetic foot care prevention to identify the items which represent desired foot care behaviors (Appendix G).

Translation of the Instruments

The MDFCK and MDFCB questionnaires were developed in English. To ensure the equality of the languages of these questionnaires, the researcher used the back translation technique (Brislin, 1970). The researcher recruited bilingual experts in this translation process. The first bilingual expert who is English lecturer translated the original English version into the Indonesian language. The Indonesian language questionnaire was then translated into the English language by the second bilingual

expert who is English lecturer. Then, the original English version and the back-translated English version were compared and evaluated to ensure the equality of both questionnaires. Next, the first and second bilingual expert discussed seeking for any discrepancies and adjust the identified disagreement between back translation version and the original version. The discrepancies appeared regarding the sentence arrangement and vocabulary selection. However, the questionnaires met the mutual agreement.

Validity and Reliability of the Instruments

Validity of the instruments. The MDFCK, MDFCB, and the program of this study were validated by three experts (Appendix J). The first and second experts are lecturers from faculty of nursing, Prince of Songkla University, Thailand. The third expert is an APN nurse who works as a lecturer in one of government's university at Indonesia. Furthermore, the educational material and teaching plan was validated by the same experts. All of the experts gave the suggestions regarding the instruments and the program. Following the suggestion, the researcher revised based on experts suggestion. The revised items included checking grammatical errors, sentence arrangement, and DM general managements and foot care related items that need adjustment.

Reliability. Twenty individuals, who had similar characteristic as the study sample, were tested for the reliability of the questionnaires. The internal consistency reliability of MDFCK questionnaire was analyzed by Kuder Richardson (KR-20), and the internal consistency reliability of MDFCB was analyzed by Cronbach's alpha

coefficient. The MDFCK questionnaire yielded a KR-20 coefficient of .75 and the MDFCB yielded a Cronbach's alpha coefficient of .81.

Pilot Study

A pilot study was conducted to evaluate the feasibility of the data collection procedure, program protocol, and measurement reliability test in order to improve the quality and efficacy of the real situation. In this pilot study, 3 participants from those 20 participants involved in reliability test were invited to participate in 2 day camp activities. The researcher observed that the program of education session and practice sessions, held in the first and the second-day program, ran according as a plan. The participants could understand the education contents that were provided. Moreover, in the practice session, participants could demonstrate the desired foot care as instructed by the researcher. The participants could follow all programs that were conducted over 2 days. Therefore, the foot care camp showed its feasibility to be implemented in diabetic patients in the community setting.

Data Collection Procedures

This data collection procedure was divided into two phases: preparation phases and implementation phases.

Preparation phase. In the preparation phase, the researcher conducted the following steps (1) obtaining research approval from the Faculty of Nursing, Prince Songkla University; (2) submitting permission letter from the Faculty of Nursing Prince of Songkla University to the Director of Public Health Office in Bojonegoro district, requesting permission for data collection at selected public health centers; (3)

presenting the data collection permission letter from director of ministry of health of Bojonegoro to the director of selected public health centers; (4) explaining the objectives, procedures, and research details to the directors of public health centers; (5) preparing questionnaire instruments and informed consent form; and (6) recruiting and conducting research assistant (RA) training.

Five RAs were recruited in this study. The first and second RAs were responsible for approaching eligible participants in two selected public health centers' outpatient clinics. In addition, they were responsible for both pre and post data collection in the control and experimental groups. The researcher had no role in collecting outcomes data. In the implementation on day one and day two, the third, the fourth and the fifth RAs helped the researcher to organize FC camp activities including facilitating participants in the practice session, controlling activity in recreational session as well as preparing the camp venue. The researcher and the third, the fourth, and the fifth RAs were responsible for providing education regarding general DM management and foot care management during FC camp.

Prior conducting the FC camp, the researcher conducted 2 days training session for 5 RAs. The researcher trained each RA regarding his and her responsibility in two-day camp activities. The researcher explained the purposes of the study, the program protocol, the data collection procedures, and the procedure to fill the questionnaire. To the third, the fourth and the fifth RAs, the researcher explained the contents of education session and practice session. Then the researcher asked them to demonstrate the education session and practice session to another RAs supervised by the researcher. The misconceptions and discrepancies appeared were discussed at the end of training session. The content of the general diabetic

management and foot care management followed the guideline provided by the researcher. The discussion session was organized after the training session to discuss dissimilar understanding in the questionnaire items and education sessions between RAs and the researcher. Since this camp conducts by the team, the researcher provided the study protocol to guide all team members to run the program during the FC camp (Appendix C).

Implementation phase. The first and the second RAs performed their duty to select participants who met inclusion criteria. The researcher provided information regarding the confidentiality, aims, procedures, benefits, risks, and grouping (experimental group and control group) to selected participants. The researcher asked the willingness of participants to join in the study. The participant who agreed to join in the study either by informed consent or verbal consent was asked to fill Demographic Data, MDFCK, and MDFCB questionnaires with holding by the first and the second RAs.

***Experimental group*.** The participants in the experimental group were gathered in public health center's start from 08.00 am to 13.00 pm at the meeting room to join FC camp. Afterward, the participants were divided into 4 groups, where each group consisted of 10-11 participants. A one-hour educational session regarding general diabetic management and foot care were presented by the researcher, the third, the fourth, and the fifth RAs in every group. After education session, the participants were gathered together and assisted to join discussion session run by the researcher. In the end of the first day, the researcher provided lunch which was suitable for diabetic patients' diet. The provided food was consulted by a dietician. During meal time, the researcher and RAs provided a brief educational session to

remind the participants regarding diabetic diet. Before participants went home, the researcher made an appointment of the second-day activity program.

Second-day activity was started at 08.00 am to 14.00 at the recreational site near the city. In the campsite, the researcher showed the practical action regarding desired diabetic foot care behaviors within 1 hour. The researcher demonstrated desired foot care behaviors then followed by all participants. The third, the fourth, and the fifth RAs helped to assist the participants to follow the instructions. Then, the researcher assisted discussion session regarding DM experiences, barriers, and difficulties in implementing foot self-care behaviors within 1 hour. Afterward, the researcher ran interactive learning through recreational activity including walking surrounding the camping ground. During the recreational activity, the researcher encourages participants to use appropriate footwear, no base foot walking, and routinely do the exercise. In addition, there was a long break to allow participants to interact with each other. In the end of the second-day activity program, the researcher distributed the diabetic foot care booklet and discussed further important topics regarding given materials to help participants understand the content clearly. Then, the researcher made an appointment regarding the next follow-up phone call.

The follow-up telephone call session was conducted 3 times weekly in the second, third, and fourth week. Brief counseling via telephone call consisted of assessing participants' foot care concern and foot care on the daily basis, reminded about foot care knowledge and desired foot care behaviors and gave reinforcement based on achievement. In the end of each telephone session, the researcher reminded the participants about foot self-care strategies and next follow-up phone call. The

post-test questionnaire was collected in the fifth week of this program by the first and the second RAs at the public health center (Appendix B).

***Control group*.** The control group pre-test was collected in the public health centers when the participants attend monthly for a general checkup. The researcher made an appointment on week fifth for next meeting during their monthly general checkup at public health centers afterward. The implementation phase was proposed in Figure 2.

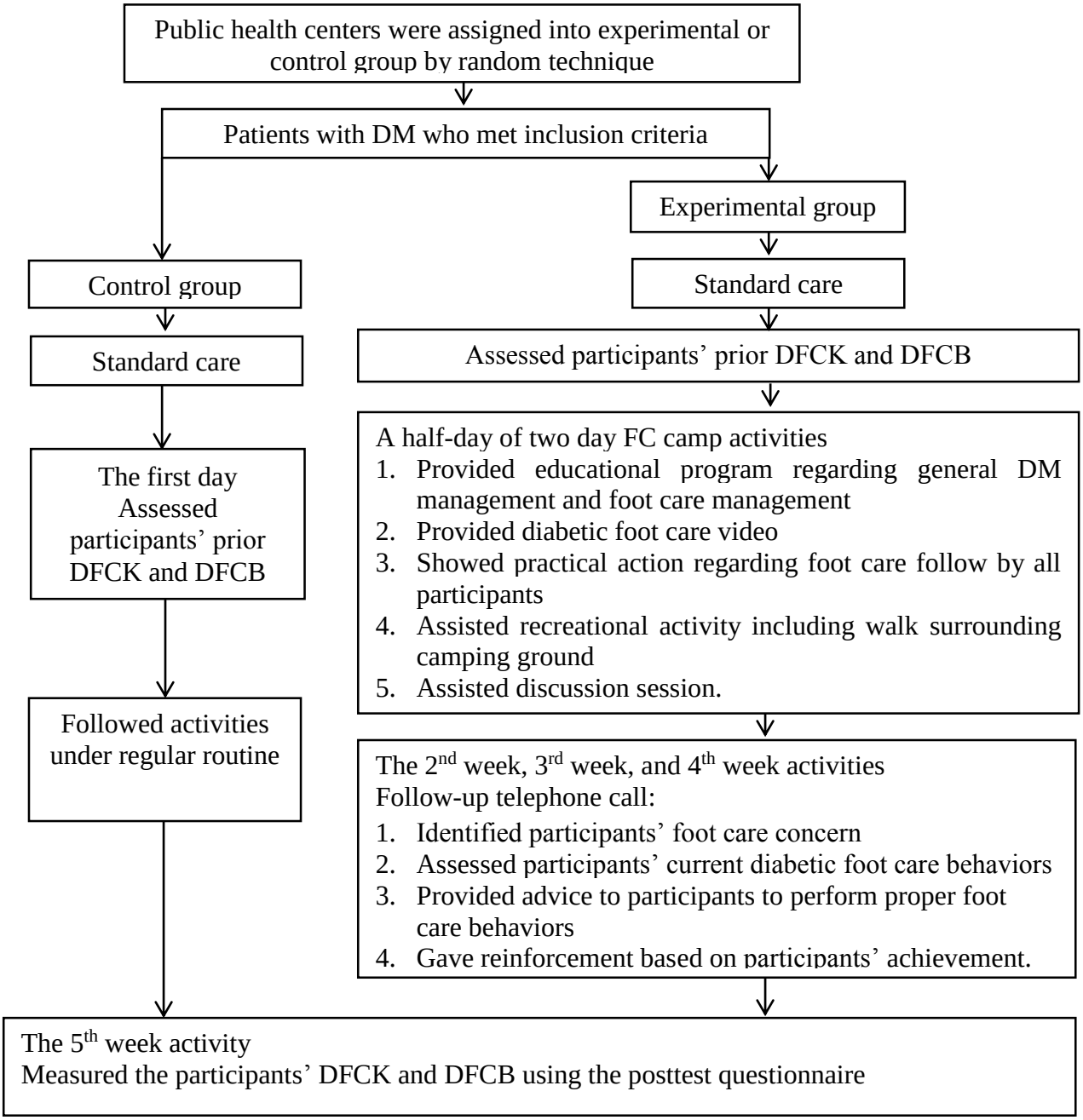

Figure 2. The Implementation Phase of the Data Collection Procedures

Ethical Consideration

This study was carried on after obtaining support from the Research Ethics Committee of Faculty of Nursing, Prince of Songkla University (Approval No. MOE 0521.1.05/3014) and agreement from Ministry of Health of Bojonegoro District

(Approval No. 440/6361/412.43/2016). The researcher elaborated the purposes of the study, the process and the potential benefits and risks of the study to the participants. The participants had the right to choose whether to participate in the program or not and also they might withdraw at any time during the program without any negative consequences. The participants took their agreement to participate in the program verbally or by written consent (Appendix A). The researcher delivered contact information including telephone number and address for future reference. All of the participants' information was kept in confidential.

Data Analysis

The researcher used descriptive and inferential statistics to analyze the data to answer the research questions. Descriptive statistic was used to describe the demographic data of participants by using frequencies, percentage, mean, and standard deviation. In order to compare the equivalence of the proportion of demographic data between the control group and experimental group, a Chi-square and Independent t-test were used.

Independent t-test was used to test the differences of the mean score of diabetic foot care knowledge and behaviors between the control group and experimental group, while Paired t-test used to test the differences of the mean score of diabetic foot care knowledge and behaviors within experimental and control group before and after receiving the FC camp. The assumptions test of normality and homogeneity of variance of diabetic foot care knowledge and behaviors variable was done and the data shown normal distributed and the variance was homogeneity (Appendix I).

Chapter 4

Results and Discussion

This chapter presents the results and discusses the study's findings. Seventy-two participants with diabetes completed the program. The results are presented in two parts including (1) demographic characteristics and general clinical information and (2) the effects of foot care camp on enhancing diabetic foot care knowledge and behaviors of participants with diabetes mellitus.

Results

The demographic characteristics and general clinical information.

Seventy-two diabetic participants at two public health centers in Bojonegoro were included in this study. In the control group (n = 35) and experimental group (n = 37) the mean ages were 57.97 years old (SD = 6.01) and 53.3 years old (SD = 7.75), respectively. The majorities in both groups consisted of female participants: 26 (74.3 %) in the control group and 27 (73 %) in the experimental group. More than half of the participants in the control group (n = 22, 62.9 %) and experimental group (n = 24, 64.9 %) were married. All participants of both groups were Muslim. Sixteen participants (43.4 %) in the experimental group had studied in an elementary school, whereas 12 participants in the control group (34.3 %) had studied in an elementary school and junior high school. Housewives were the biggest percentages of participants in the control group (n = 14, 40 %) and experimental group (n = 17, 45.9 %). The differences of demographic data between the control and experimental groups were not statistically significantly different except the age (p = .03) (Table 1).

Table 1

Demographic Characteristics of the Participants in the Control and Experimental Groups (N = 72)

Characteristics	Control Group (n = 35)		Experimental Group (n = 37)		Test statistics	*p-value*
	n	%	*n*	%		
Age (Min-Max = 36-65)	M = 57.97	SD = 6.01	M = 53.3	SD = 7.75	3.02 [a]	.03
Gender					0.16 [b]	.88
Male	9	(25.7)	10	(27)		
Female	26	(74.3)	27	(73)		
Marital status					1.45 [c]	.48
Single			1	(2.7)		
Married	22	(62.9)	24	(64.9)		
Widowed	13	(37.1)	12	(32.4)		
Religion						
Islam	35	(100)	37	(100)	1:0 [b]	1.0
Education status					4.56 [c]	.33
Elementary school	12	(34.3)	16	(43.2)		
Junior high school	12	(34.3)	8	(21.6)		
Senior high school	7	(20)	5	(13.5)		
Bachelor degree	3	(8.6)	3	(8.1)		
No education	1	(2.9)	5	(13.5)		
Occupation					5.26 [c]	.26
Government employee	1	(2.9)	3	(8.1)		
Private employee	10	(28.6)	7	(18.9)		
Housewife	14	(40)	17	(45.9)		
Retired	8	(22.9)	4	(10.8)		
Farmer	2	(5.7)	6	(16.2)		

Note: a = independent t-test, b = chi-square, c = likelihood, M = mean, SD = standard deviation

Table 2 shows the general clinical information regarding diabetes mellitus. The majority of participants in the control group had experienced DM for more than 5 years (n = 57, 57.1 %) while most of the participants in the experimental group had experienced DM from 1 to 5 years (n = 16, 43.2 %). Passive smokers comprised 51.4 % (n = 18) in the control group while only 13.5 % (n = 5) were passive smokers in the experimental group. The average latest blood glucose was 202.9 mg/dL (SD = 73.3) in the control group and 230.49 mg/dL (SD = 86.4) in the experimental group. The percentages of participants in the control group and experimental group who had signs of neuropathy were 45.7 % (n = 16) and 32.4 % (n = 12), respectively.

More than half of the participants in the control group (*n* = 27, 77.1 %) and experimental group (*n* = 32, 86.5 %) had no signs of peripheral arterial disease. The majority of participants in the control group (*n* = 34, 97.1 %) and in the experimental group (*n* = 37, 100 %) did not have foot deformity. Only 20 % (*n* = 7) of the participants in the control group and 16.2 % (*n* = 6) in the experimental group had a history of foot ulcer. There was no statistical difference of general clinical information between the control and experimental groups except DM duration (*p* = .01) and smoking status (*p* < .001) (Table 2).

Table 2

General Clinical Information of the Participants in the Control and Experimental Groups (N = 72)

Characteristics	Control Group (*n* = 35)		Experimental Group (*n* = 37)		Test statistics	*p-value*
	n	%	*n*	%		
BMI (Min-Max = 16.9-32)	*M* = 23.5	*SD* = 3.1	*M* = 24.01	*SD* = 3.33	-0.68 [a]	.49
Latest blood glucose (mg/dL) (Min-Max = 105-450)	*M* = 202.9	*SD* = 73.3	*M* = 230.4	*SD* = 86.4	-1.45 [a]	.15
Comorbid disease					0.01 [b]	.97
No	15	(42.9)	16	(43.2)		
Yes	20	(57.1)	21	(56.8)		
DM duration					8.27 [c]	.01
< 1 year	7	(20)	12	(32.4)		
1-5 years	8	(22.9)	16	(43.2)		
> 5 years	20	(57.1)	9	(24.3)		
Smoking status					22.96 [c]	< .001
Never	9	(25.7)	27	(73)		
Stopped <1 year	1	(2.9)	3	(8.1)		
Stopped ≥ 3 years	7	(20)	2	(5.4)		
Passive smoker	18	(51.4)	5	(13.5)		
Neuropathy Signs					1.33 [b]	.24
No	19	(54.3)	25	(67.6)		
Yes	16	(45.7)	12	(32.4)		
PAD signs					1.06 [b]	.30
No	27	(77.1)	32	(86.5)		
Yes	8	(22.9)	5	(13.5)		
Foot deformity					1.07 [d]	.48
No	34	(97.1)	37	(100)		
Yes	1	(2.9)				

Characteristics	Control Group (n = 35)		Experimental Group (n = 37)		Test statistics	*p-value*
	n	%	*n*	%		
History of foot ulcer					0.17 [b]	.67
No	28	(80)	31	(83.8)		
Yes	7	(20)	6	(16.2)		

Note: BMI = body mass index, DM = diabetes mellitus, PAD = peripheral arterial disease, a = independent t-test, b = chi-square, c = likelihood, d = Fisher's exact test, *M* = mean, *SD* = standard deviation

Diabetic foot care knowledge and behaviors between groups. The researcher compared diabetic foot care knowledge and behaviors between the experimental and control groups to determine the effect of foot care camp on diabetic foot care knowledge and behaviors. Table 3 shows that the difference of diabetic foot care knowledge (DFCK) between the experimental and control groups in the pretest was not statistically significantly different (t = .94, p = .34). On the other hand, after receiving the 5-week program, the participants in the experimental group had better diabetic foot care knowledge than those who received standard care (control group) (t = -4.49, $p \leq .001$). After receiving the foot care (FC) camp, the mean score of diabetic foot care behavior (DFCB) in the experimental group (M = 73.51, SD = 13.16) was significantly better than that in the control group (M = 51.23, SD = 9.91) ($p < .001$).

Table 3

Comparisons of the Mean Diabetic Foot Care Knowledge (DFCK) and Diabetic Foot Care Behavior (DFCB) Scores Between the Two Groups (N=72)

Variables	Control group (n = 35)		Experimental group (n = 37)		*t*	*p-value*
	M	*SD*	*M*	*SD*		
DFCK pretest	8.94	2.12	8.46	2.21	.94	.34
DFCK posttest	9.34	2.22	11.59	2.02	-4.49	< .001
DFCB pretest	47.83	9.29	48.76	12.96	-.34	.72
DFCB posttest	51.23	9.91	73.51	13.16	-8.14	< .001

Note: DFCK = diabetic foot care knowledge, DFCB = diabetic foot care behavior, *M* = mean, *SD* = standard deviation, df = 70

Diabetic foot care knowledge and behaviors within the groups. Table 4 shows the mean of diabetic foot care knowledge and behaviors within the groups. In the experimental group, the DFCK and DFCB scores were significantly better than before receiving the FC camp ($p < .001$). In addition, the DFCB score of the control group in the fifth week after receiving standard care showed significantly better behavior than in the first week ($p = .01$). However, there were no significant differences in the DFCK scores within the control group in the pretest and the posttest (Table 4).

Table 4

Comparisons of the Mean of Diabetic Foot Care Knowledge (DFCK) and Diabetic Foot Care Behavior (DFCB) Scores of Each Group (N=72)

Variables	Pretest		Posttest		*t*	*p-value*
	M	*SD*	*M*	*SD*		
Control group (*n* = 35)						
DFCK	8.94	2.12	9.34	2.22	-1.83	.07
DFCB	47.83	9.29	51.23	9.91	-2.47	.01
Experimental group (*n* = 37)						
DFCK	8.46	2.21	11.59	2.02	-7.14	< .001
DFCB	48.76	12.96	73.51	13.16	-11.26	< .001

Note: DFCK = diabetic foot care knowledge, DFCB = diabetic foot care behavior, *M* = mean, *SD* = standard deviation, df for control group = 34, df for experimental group = 36

Discussion

Four hypotheses were used to test the effectiveness of the FC camp in this study. According to the data analysis, all of the alternative hypotheses were accepted. The mean scores of DFCK and DFCB in the experimental group were better than in the control group. In addition, the DFCK and DFCB after receiving FC camp in the experimental group showed better scores than before receiving the FC camp.

Diabetic foot care knowledge between groups. One of the aims of this study is to examine the effect of FC camp in order to enhance diabetic foot care knowledge of an individual with diabetes mellitus in Indonesia. The results of the study revealed that a comparison between the groups showed that the mean score of DFCK in the experimental group was significantly better than in the control group. Three main

factors that possibly influenced the development of DFCK in the experimental group include (1) the concepts of camp, (2) educational environment, and (3) the educational strategies provided at the camp.

First, the concepts of the camp are believed to be the main factors in the development of DFCK in the experimental group. The FC camp combined the concepts of motivating, learning, and socializing in order to enhance the effectiveness of the educational strategy. The concept of learning that occurred during the camp activities was useful as it allowed the participants and the researcher to share knowledge regarding foot ulcer prevention. The combination of the learning and socializing concepts in the FC camp allowed the participants to receive interactive learning regarding foot ulcer prevention. Moreover, the motivating activities used during the FC camp encouraged the participants to pay attention to the education program that was provided. Based on reviews of other studies, these three concepts effectively enhanced the knowledge in adult populations, namely motivation (Brewer-Lowry, Arcury, Bell, & Quandt, 2010; Choi, Song, Chang, & Kim, 2014), learning (Choi, Song, Chang, & Kim, 2014), and socialization (Akca & Cinar, 2008; Hunt, Grant, Pryor, Moneyham, Wilder & Steele, 2012).

Second, the FC camp was conducted at a recreational site that offered an unthreatening and open environment. The educational program provided in the FC camp combined health education with recreational activities that provided a comfortable atmosphere while receiving the given material. The combination of health education with recreational activities is believed to more effectively capture the attention of the participants and provide a less stressful educational environment for enhanced beneficial outcomes of the camp. By being relaxed, the participants

remembered and understood the educational content more easily (Bensley & Brookins-Fisher, 2003).

Third, the strategies provided in the FC camp combined health education with watching a video and demonstrations, and participating in discussions. These activities contributed to the attraction of the program and the participants were able to follow the educational elements of the program. The combination of health education with a related video got more attention because it was new and not usually used in a field study. Moreover, the demonstration sessions helped the participants to visualize the foot care related contents. The discussions provided at the end of each session made the education session more interactive. With the strategies provided, the participants could pay attention, be aware, and remember and understand foot care to prevent the emergence of a foot ulcer. The results were congruent with several studies that used a combination of lectures with interactive strategies (video, demonstration, and discussion) (Monami et al., 2015; Kurniawan et al., 2011; Pérez-Borges et al., 2015). Those studies proved to significantly enhance foot care knowledge in diabetic patients.

Based on the literature review, age is one of the characteristics of participants that can potentially influence the outcome of DFCK (Desalu et al., 2011). Based on the results of that study, the mean age of the participants in the experimental group was significantly lower than the mean age of the participants in the control group ($p < .05$). This result possibly influenced the dropout rate of the participants during the study. According to the study by Desalu et al. (2011), older diabetic participants were less knowledgeable in foot care; however, further analysis in this current study found that the characteristic of age did not definitely influence the outcome of DFCK.

A comparison between the levels of age showed no statistically significant difference between the participants aged < 50 years and 50-65 years of age on the outcome of DFCK (Appendix I). Therefore, the age variable would not be a factor related to the different outcomes of DFCK between the groups.

Diabetic foot care behaviors between groups. Besides the observation of the effectiveness of FC camp to enhance DFCK, another aim of this study is to prove the effectiveness of FC camp to enhance DFCB among individuals with DM in Indonesia. Knowledge and good behaviors of the participants are needed to prevent foot ulcer. It was shown that the mean score of DFCB in the experimental group was better than in the control group. Several factors possibly influenced this result. Those factors were DFCK and the concepts of the camp.

First, basic knowledge of the participants regarding diabetic foot ulcer (DFU) prevention became the factor that could influence the outcome of DFCB. Participants with better knowledge of foot care tended to have better results in DFCB. However, the biggest challenge of this study was converting foot care knowledge into proper foot care behaviors. Poor habits regarding foot care, such as an improper diabetic diet, walking barefoot, and inappropriate toenail care were common in the study settings. However, since the educational program provided in FC camp effectively enhanced DFCK, the results should have determined the outcome of DFCB. A study done by Li et al. (2014) mentioned that the participants with good diabetic foot care knowledge showed better diabetic foot care behaviors and vice versa.

Second, the combination of motivating, learning, and socializing concepts are pivotal to enhance DFCB. The combination of those concepts is believed to enhance the enthusiasm of the participants to transfer their knowledge into desired foot care

behaviors. Traditionally, a face-to-face or the individual educational approach becomes the strategy used as standard care in both experimental and control groups. However, in this study it was difficult to arrange a proper time for a face-to-face educational session. One systematic review suggested that more interaction between the participants and health care providers is pivotal in a foot care prevention program (Bazian Ltd., 2005). In the learning and socializing concepts, the group-based educational session was used to improve interaction between the participants and health practitioners. The participants could not only learn the contents of preventing foot ulcer, but they also socialized with similarly affected participants during the group-based educational program that was provided. Therefore, the confidence of the participants in the application of diabetic foot care practice could improve by interacting with others who faced similar problems. Moreover, during the group-based educational session, participants could learn not only from the health education session but also from the questions raised during the FC camp. Based on Hwee et al. (2014), group-based educational sessions resulted in better care and outcomes due to the opportunities to share problems with similarly affected participants.

During the FC camp, several motivational activities were done to enhance DFCB of the participants. The researcher, as the trainer in the FC camp, provided motivation by encouraging the participants to transfer their knowledge they got into action during a practice session. In addition, during telephone call sessions, the trainer encouraged participants to overcome the barriers that occurred to achieve desired foot care behaviors. Peer support improved the confidence of the participants in the application of diabetic foot care practice by interacting with others who faced similar problems. Motivation is believed to increase the amount of energy and effort to

achieve the needs of the participants. The emotional support and companionship as motivating concepts encouraged an intrinsic motivation in the diabetic patients which resulted in a change of behaviors (Beljic, 2007).

In addition, the results within the experimental group revealed that the DFCB of participants after receiving the FC camp was better than before the FC camp. This result supported the effectiveness of the FC camp to enhance DFCB among the participants in this study.

Diabetic foot care knowledge and behaviors within the control groups. In the control group, the results of DFCK in the fifth week after receiving standard care were not significantly better than in the first week. It indicated that standard care in the public health center was not sufficiently effective to enhance the knowledge regarding foot care among diabetic patients even though there were several monthly programs for diabetic patients in that area that included examinations of vital signs and blood glucose along with follow-ups on medications and health education (medication used, exercise and diabetic diet). At the study setting, limited face-to-face interaction with the health practitioner became the main issue. It seemed difficult to arrange a proper time for face-to-face educational sessions because only one or two health practitioners were in charge while many patients were queuing for medications.

However, the scores of DFCB in the control group in the fifth week after receiving standard care were significantly better than in the first week. This result was possibly due to the interaction between the participants and health care providers during health education in standard care. However, when the increments of the mean DFCB scores within the experimental group and control group were compared, it was found that the increment of the mean DFCB score in the experimental group was

better than in the control group (Appendix I). Therefore, this study proved that the FC camp more effectively enhanced DFCB than the standard care.

Chapter 5

Conclusions and Recommendations

This chapter presents the conclusion according to the findings of the study and includes the strengths and limitations of the study. Implications and recommendations for nursing practice and further research are also offered.

Conclusions

This quasi-experimental study was conducted to test the effectiveness of FC camp in order to enhance DFCK and DFCB in diabetic participants. This study was conducted in public health centers located in Bojonegoro district. Two public health centers in Ngumpakdalem and Bojonegoro were selected because they have a large population of DM patients. Seventy-two participants met the inclusion criteria and were enrolled into the study. In order to achieve similarity across the participants in the control and experimental groups, the participants were matched on age (± 5 years), gender, and level of education. Thirty-five participants were in the control group while 37 participants were in the experimental group.

The consecutive 5-week FC camp program was administered to participants in the experimental group. In the first half-day of activities, the participants were gathered in the meeting room of the public health center to receive the group-based educational session and discussion session. A PowerPoint presentation and video were combined with the learning session for interactive learning. In the second half-day of activities, the educational sessions were conducted at recreational sites. Foot care demonstrations were used to visualize the foot care related contents. In addition,

3 weeks of telephone call sessions were done to maintain the behaviors of the participants related to foot care. Data collection of DFCK and DFCB were done in the fifth week of the program.

The MDFCK and MDFCB questionnaires were used to collect the data of DFCK and DFCB. The instruments were translated into the Indonesian language by the back translation technique. The questionnaires were validated by three experts. The MDFCK questionnaire yielded a KR-20 coefficient of .75 and the MDFCB yielded a Cronbach's alpha coefficient of .81.

The results of this study showed that the participants who received FC camp had a better mean DFCK score (M = 11.59, SD = 2.02) than those who received standard care (M = 9.34, SD = 2.22) (t (70) = -4.49, $p < .001$). The mean DFCB score in the experimental group (M = 73.51, SD = 13.16) was significantly better than in the control group (M = 51.23, SD = 9.91) (t (70) = -8.14, $p < .001$). These results were corroborated with the mean scores of the DFCK and DFCB in the posttest of the experimental group which was better than the pretest mean scores. Therefore, this study proved that the FC camp more effectively enhanced DFCK and DFCB than the standard care provided by the public health center.

Strengths and Limitation

Strengths. In order to prevent the development of DFU, participants should be aware not only of foot care management but also on general DM management. Therefore, the domain of general diabetic management was added in the concept of foot care in this study to provide education regarding blood glucose control, blood pressure control, lipids control, and smoking cessation. Moreover, the follow-up

sessions with telephone calls were suitable to the purpose of maintaining foot care practices. In addition, the MDFCK and MDFCB instruments were developed specifically for Indonesian patients with DM.

Limitation. This current study was conducted within 5 weeks, which possibly did not manage to sustain long-term diabetic foot care behaviors.

Implication and Recommendation

Based on the findings of this study, FC camp proved to enhance DFCK and DFCB among diabetic patients. Therefore, this program can be utilized for nursing practice and nursing research.

Nursing practice. FC camp should be incorporated into the standard care of public health centers in community settings. It is feasible to include a FC camp as standard care in public health centers because it saves time and money and reduces the workload of health care providers. The FC camp can be applied to nursing practice to enhance diabetic foot care knowledge and behaviors. With the engagement of DFCK and DFCB, the incidence of DFU and amputation may be reduced.

Nursing research. The findings of this study can be used as information for future studies associated with FC camps and diabetic foot care knowledge and behaviors. The concept of motivating, learning, and socializing in a FC camp can be used to enhance knowledge and behaviors in other chronic diseases. A future study is recommended to examine the number of patients who developed DFU in the experimental group. Strategies that use the cultural context should be included in the next FC camp study. Moreover, a longitudinal study would be a benefit to examine whether the participants in the experimental group can sustain the foot care behaviors.

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Appendices

Appendix A

Informed Consent Form

My name is Angger Anugerah Hadi Sulistyo, I am a master degree student of the Faculty of Nursing, Prince of Songkla University, Thailand. I am conducting a research entitled “Effect of Diabetic Foot Ulcer Camp on Diabetic Foot Care Knowledge and Behaviors in Indonesian Individuals with Diabetes Mellitus”. The research findings will be contributed to enhance diabetic foot care knowledge and behaviors in individual with diabetes mellitus. This study has been approved by Research Ethics Committee, Faculty of Nursing, Prince of Songkla University Thailand. I would like to ask you to participate in 5-week research project. If you agree to participate in my study voluntary, I would like to start the following procedures:

1. Explanation Procedures
    A. Grouping
        1) You will be assigned either experimental group or control group by using community setting (Public Health Center)
        2) If you are in experimental group, you will receive the usual care which has been set from the primary public health center and also receive the DFU camp during the research project. The DFU camp consists of 2 days camping program including motivating, learning, and socializing process to achieve the goal. Follow-up by phone call will be conduct among 3 weeks after two-day camp.

3) If you are in the control group, you will continually receive the usual care based on standard care from public health center. However if you want to receive similar program for experimental group, you will receive DFU camp after completing the study.

B. Evaluation and forms

You will be asked to fill in the form about the demographic data and health information that will be taken approximately 10 minutes. You will be asked to fill the diabetic foot care knowledge and behaviors questionnaires in the first day camp and in the last week of the project which will be taken approximately 10-20 minutes.

2. Risk and comfort

There is no harm to you to join this project and it is free for you to participate. However, the program makes you spend more time and if you may feel tired, you can take a rest and continue doing it on your available time.

3. Confidentiality

All of the information and your responses in my study will be maintained the confidentiality of your information. Only the researcher, the data collectors and my research advisors are eligible to access the data. I will make initial of your name and your personal information such as "Mr/Mrs/Miss A". it will be used in the report of my study. Furthermore, your data will be reported as will be presented as a group and individual.

4. Beneficence

The result of this research can be used as a protocol or guidelines for nursing intervention and other health care professional in particular at Public

Health Center in Bojonegoro District, Indonesia. This program has benefits to improve the diabetic foot care knowledge and behaviors in order to prevent the development of DFU.

5. Participation and withdrawal from participation

Your participation in this study is voluntary. If you join the study, you can change your mind later. You can decide not to take part or you can quit at any time. There will be no penalty or loss of benefits if you decide to quit the study.

If you have any question, suggestion or cannot participate in my research, you can directly contact my mobile phone as researcher (+62……) or by email at angger.anugerah@gmail.com. Eventually, if you agree to be participants in my research, please kindly sign your name on the consent form.

Date, ……..

(…….) (……..)

Name of participant Angger Anugerah H.S

Appendix B

The Guideline of Foot Care Camp

Time	Objectives	Method	Duration	Activity	
				Researcher	Participants
First half-day	Introduction	Discussion and sharing	15 minutes	• Explain the purpose, protocols, procedure, risks, and benefit of the 1st day program • Encourage participants to actively participate in foot care camp	Pay attention Ask or clarify regarding information
	Assessment diabetic foot care knowledge and behaviors	Distribute the questionnaires	20 minutes	• Facilitate RAs to assess the DFCK and DFCB	Fill the questionnaire
	Group-based educational session	Lecture, discussion, watching related video	60 minutes	• Explain the importance of DFU prevention activity • Explain the general information of DFU including definition and pathophysiology. • Provide education regarding DFU prevention care including general DM management and foot care management • Provide foot care management related video • Encourage participant to perform DFU prevention activity as daily life	Pay attention Ask question Clarify some information
	Discussion session	Group discussion	60 minutes	• Assist discussion session after lecture • Encourage participant to actively ask question or clarify unclear information • Provide the answer regarding emerged question	Discuss Ask question Pay attention

90

Teaching Plan for Group-Based Education, Discussion, and Practice Session

No.	Session	Topic	Objectives	Content	Method/ Time	Activities		Outcomes
						Researcher	Patients	
1.	Group-based educational session	Introduction	• To increase knowledge regarding the disease • To improve participants understanding regarding the DM complication • Encourage participants to pay attention until in the end of session	• Researcher will provide general information about DM, DM complication, and encourage participant follow the program until in the end of the session	10 minute lecture	• Explain the general information regarding DM • Provide information regarding DM complication	• Pay attention • Clarify unclear information	• Participants understand about DM, DM complication • Participants aware about their condition
3.	Practice session	Demonstration of desired foot care behaviors	• To provide demonstration of desired foot care behaviors	• Researcher will show some practical actions to reduce the risk of foot ulcers: **Foot Examination** Demonstrate how to examine feet using mirror **Foot wash** Provide appropriate soap, water (not hot water)	60 minutes demonstration	• Demonstrate desired foot care behaviors	**Foot examination** Pay attention Practice follow instructor **Foot wash** Pay attention Practice follow instructor **Appropriate foot wear** Patients were asked to trace the outline of their	• Increased participant confident to apply desired foot care behaviors • Understand how to practice desired foot care behaviors

Appendix C

Study Protocol of Day 1 and 2

Time	Protocol	Teams
Day 1		
08.00-08.30	Registration	Researcher and RAs
08.30-08.45	Introduction	Researcher
08.45-09.05	Assessment diabetic foot care knowledge and behaviors	RA 1 and RA 2
09.05	Divide the participants into 4 small group	RAs
09.15-10.15	Group-based educational session	Researcher and RAs
10.15-11.15	Discussion session	Researcher
11.15-12.15	Meal time	Researcher and RAs
Day 2		
08.00-08.30	Registration	Researcher and RAs
08.30-09.30	Go to camp ground	Researcher and RAs
09.30-09.45	Introduction	Researcher
09.45-10.45	Demonstration and practices	Researcher, RAs (as facilitator)
10.45-11.45	Recreational activity	Researcher and RAs
11.45-12.45	Discussion and provide meal	Researcher and RAs

Appendix D

Diabetic Foot Care Booklet

Diabetic Foot Care

This Booklet consist of desired foot care activity to prevent diabetic foot ulcer.

Diabetes and Healthy Feet

Master of Nursing (International Program)

Prince of Songkla University

2016

Appendix E

DEMOGRAPHIC DATA QUESTIONNAIRE

Instruction:

Below is the form to acquire information about your current demographic data and health information.

Subject No. : ……

Date : ……

Phone number : ……

Age : ……

Gender : ☐ Male ☐ Female

Marital Status : ☐ Single ☐ Married ☐ Widowed

Religion : ☐ Islam ☐ Christian ☐ Catholic ☐ Hinduism ☐ Buddhist

Education Level : ☐ Elementary school ☐ Junior high school ☐ High school ☐ Diploma degree ☐ Bachelor degree ☐ Master degree ☐ Doctoral degree

Occupation : ☐ Government employee ☐ Private employee ☐ Housewife ☐ Retired ☐ Farmer ☐ Other, specify ……

Income : …… Rupiah

Weight : ……

Height : ……

BMI : ……

Appendix F

The Modified Diabetic Foot Care Knowledge Questionnaire

Date of data collection :

Direction :

Please fill the blank and give the mark (√) in the bracket which appropriate to your answer where indicated based on your knowledge. There are two choices available: 1 = true, 0 = false. Thank you.

No	Statement	True	False
1.	It is important to keep blood glucose (sugar) in target range to prevent DFU*	√	
2.	It is normal if the glucose level before meal is in 180 mg/dl*		√
3.	Liver and other organ meats are example of good fat for DM patients*		√
4.	Regular physical activity can help reduce high blood pressure*	√	
5.	Smoking will influence the development of DFU*	√	
6.	DM patients must check the temperature of water that they will use to wash his/her feet	√	
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			

Note: *added items, √ means the best answer.

These symbols was not be on the questionnaire given to the DM patients.

	Appendix G **The Modified Diabetic Foot Care Behavior Questionnaire**	
	Code :	
	Date :	
	Direction :	
	We would like to know what you do in the last week to care your feet. Please tick (√) the category which best reflects what you actually do. Please answer every question. Thank you.	
1.	Do you eat lots of sweets or other foods rich in carbohydrates?*	
	(0) Always (2) Rarely	(1) Sometimes (3) Never
2.	Do you have regular physical activity to achieve optimal blood sugar levels?*	
	(3) Always (1) Sometimes	(2) Often (0) Rarely/Never
3.	Do you strictly follow the dietary recommendations given by your doctor or diabetes specialist?*	
	(3) Always (1) Sometimes	(2) Often (0) Rarely/Never
4.	Do you check and monitor your blood sugar levels regularly?*	
	(3) Always (1) Sometimes	(2) Often (0) Rarely/Never
5.	How many times you inspect your foot conditions?	
	(3) More than once/day (1) 4-6 times a week	(2) Once/day (0) Once/week or less
….		
34.		
	Note: *added items These symbols was not be on the questionnaire given to the DM patients.	

Appendix H

Sample Size Calculation

Effect size (d) = M_1-M_2/ pooled SD

Where, Pooled SD = $\sqrt{[(SD_1)^2 + (SD_2)^2/2]}$

Definition:

M_1, M_2 and SD got from previous study

M_1= mean of experimental group

M_2= mean of control group

Pooled SD: standard deviation of the control group and experimental group

In this study, researcher used previous study M_1= 8.08 and control group M_2= 7.17 and SD_1= 0.88 and SD_2= 1.91

Pooled SD $= \sqrt{[(SD_1)^2 + (SD_2)^2/2]}$

$= \sqrt{[(0.88)^2 + (1.91)^2/2]}$

$= \sqrt{[2.14]}$

$= 1.46$

Effect size (d) = M_1-M_2/ pooled SD

= 8.08 - 7.17 / 1.46

= 0.62

Appendix I

SPSS Outcomes

1. The assumptions test of normality and homogeneity of variance

a. Normality

The assumption of normality was examined by using the values of skewness and kurtosis divided by their standard error. The result from testing assumption showed that the data set of DFCK and DFCB were normally distributed, determined by values were in the range of ± 3

The assumption of normality of DFCK and DFCB

Variables		Statistics (a)	Standard error (b)	Z value (a/b)
Pretest DFCK				
Control group	Skewness	-.310	.398	-0.78
	Kurtosis	.679	.778	0.87
Experimental group	Skewness	-.459	.388	-1.19
	Kurtosis	-.134	.759	-0.18
Posttest DFCK				
Control group	Skewness	-.563	.398	-1.42
	Kurtosis	.603	.778	0.78
Experimental group	Skewness	.164	.388	0.42
	Kurtosis	-1.167	.759	-1.54
Pretest DFCB				
Control group	Skewness	-.161	.398	-0.41
	Kurtosis	-.193	.778	-0.25
Experimental group	Skewness	-.603	.388	-1.56
	Kurtosis	.181	.759	0.24
Posttest DFCB				
Control group	Skewness	.175	.398	0.44
	Kurtosis	1.124	.778	1.45
Experimental group	Skewness	-.280	.388	-0.72
	Kurtosis	-1.439	.759	-1.90

b. Homogeneity

The homogeneity of varience was examined by using the Levene's test of equality of error variance. The result from the testing showed that the data set of DFCK and DFCB in before and after the program were not significant differences, determined by the *p* values > .05.

Variables	Levene's Test	
	F	Sig
DFCK	.006	.938
DFCB	3.624	.061

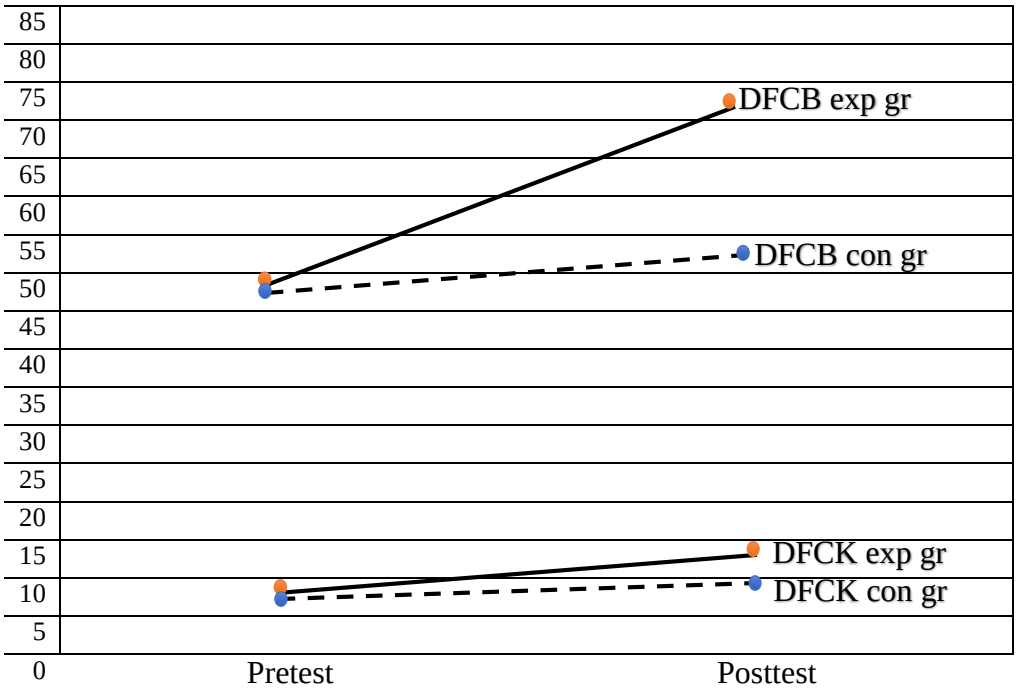
2. Comparison between levels of age among participants

Variable	Age		*t* statistic	*p-value*
	< 50 years	50 – 65 years		
DFCK	18 (11.06)	54 (10.31)	1.14	.26
DFCB	18 (71.44)	54 (59.76)	2.78	.007

3. Delta different of mean

Variable	Pretest (n = 35)	Posttest (n = 37)	Δ different of mean
	M (SD)	M (SD)	
Control group			
DFCK	8.94 (2.12)	9.34 (2.22)	0.4
DFCB	47.83 (9.29)	51.23 (9.91)	3.4
Experimental group			
DFCK	8.46 (2.21)	11.59 (2.02)	3.13
DFCB	48.76 (12.96)	73.51 (13.16)	24.75

The increment of DFCK and DFCB in experimental and control groups



Appendix J

List of Experts

1. Asst. Prof. Dr. Tippamas Chinnawong

   Faculty of Nursing, Prince of Songkla University, Thailand

2. Dr. Charuwan Kritpracha

   Faculty of Nursing, Prince of Songkla University, Thailand

3. Yunita Sari., RN., Phd

   Faculty of Nursing, University of Jendral Soedirman, Indonesia

Appendix K

Letters

1. Ethics committee approval from Prince of Songkla University

FACULTY OF NURSING

PRINCE OF SONGKLA UNIVERSITY

P.O. BOX 9, KHOR HONG, HATYA
SONGKHLA, THAILAND, 90112
FAX NO. 66-74-286421
TEL. NO. 66-74-286456,
66-74-286459

MOE 0521.1.05/3014

Ethics Committee Approval

December 6, 2016

To whom it may concern:

This letter is to confirm that the Nursing Faculty Ethics Committee approved the research study of Mr.Angger Anugerah Hadi Sulistyo ID. 5810420002 entitled "The Effect of Foot Care Camp on Diabetic Foot Care Knowledge and Behaviors of Individuals with Diabetes Mellitus in Indonesia" on November 14, 2016. The study is a major part of Mr.Angger Anugerah Hadi Sulistyo's Master Degree at the Faculty of Nursing, Prince of Songkla University, Thailand. The study ensures the rights, safety, confidentiality, and welfare of research participants and it was determined that the study would not be harmful to the participants in the future.

Sincerely,

Waraporn

Assistant Professor Dr.Waraporn Kongsuwan
Associate Dean for Research, Graduate Studies, and International Affairs
Prince of Songkla University,
Hat Yai, Songkhla, 90112, Thailand
Tel: 66-74-286404
Fax: 66-74- 286421

2. Recommendation letter for conduct research from government of Bojonegoro District

PEMERINTAH KABUPATEN BOJONEGORO
BADAN KESATUAN BANGSA, POLITIK DAN PERLINDUNGAN MASYARAKAT
Jl. Trunojoyo No. 12 Telepon / Fax. (0353) 893526
BOJONEGORO

SURAT REKOMENDASI
Nomor : 072 / **636** / 204.412 / 2016

TENTANG
SURVEY/ RESEARCH/ PENELITIAN/ KKN

Dasar :
a. Peraturan Menteri Dalam Negeri Republik Indonesia Nomor 7 Tahun 2014 Tentang Perubahan Atas Peraturan Menteri Dalam Negeri Republik Indonesia Tomor 64 Tahun 2011 Tentang Pedoman Penerbitan Rekomendasi Penelitian
b. *Peraturan Bupati Bojonegoro Nomor 18 Tahun 2011 Tentang Perubahan Atas Peraturan Bupati* Bojonegoro Nomor : 5 Tahun 2009 Tentang Tugas Pokok Dan Fungsi Inspektorat , Badan Perencanaan Pembangunan Daerah Dan Lembaga Teknis Daerah Kab.Bojonegoro sebagaimana telah dirubah beberapa kali terakhir dengan Peraturan Bupati Bojonegoro Nomor 40 Tahun 2013 Tentang Perubahan ketiga Atas Peraturan Bupati Bojonegoro Nomor : 5 Tahun 2009 Tentang Tugas Pokok Dan Fungsi Inspektorat , Badan Perencanaan Pembangunan Daerah Dan Lembaga Teknis Daerah Kab.Bojonegoro
c. Peraturan Bupati Bojonegoro Nomor 33 Tahun 2014 Tentang Penyelenggaraan Perijinan Dan Non Perijinan Di Kabupaten Bojonegoro
d. Peraturan Bupati Bojonegoro Nomor 63 Tahun 2014 Tentang Pelimpahan Wewenang Bupati Di Bidang Perijinan Dan Non Perijinan Kepada Kepala Satuan Kerja Perangkat Daerah Dan Camat
e. Surat Ketua Stikes ICSADA Bojonegoro No:198/A/073.158/ST-1/ii/2016 tanggal 27 Desember 2016 hal Permohonan Ijin Penelitian.

MENGIZINKAN :

1.	Nama	:	**ANGGER ANUGERAH HADI SULISTYO**
2.	NIK	:	091403048
3.	Alamat	:	Jl. Dr.Wahidin No.68 A Bojonegoro
4.	Civitas/Prodi	:	Stikes ICSADA Bojonegoro/ Ilmu Keperawatan
5.	Prodi	:	S1 Keperawatan
6.	Keperluan	:	Penelitian.
7.	Judul	:	Efektifitas Foot Care Camp Terhadap Pengetahuan Dan Perilaku Perawatan Kaki Pada Penderita Diabetes Melitus Di Indonesia
8.	Tempat penelitian	:	❖ Dinas Kesehatan Kab. Bojonegoro - Peskesmas Bojonegoro Kab. Bojonegoro - Peskesmas Ngumpakdalem Kec.Dander Kab. Bojonegoro
9.	*Waktu*	:	*Tmt 29 Desember 2016 s/d 30 Februari 2017*

DENGAN KETENTUAN SEBAGAI BERIKUT :

1. Dalam jangka waktu 1 x 24 jam tiba ditempat yang dituju diwajibkan melaporkan kedatangannya kepada Kecamatan/Kantor Instansi setempat.
2. Mentaati ketentuan yang berlaku dalam daerah □esa/instansi setempat.
3. Menjaga tata tertib keamanan dan kesusilaan serta menghindari penyataan-pernyatan baik lisan maupun tulisan yang dapat melukai / menyinggung perasaan atau menghina Agama, Bangsa dan Negara dari suatu golongan penduduk.
4. Tidak diperkenakan menjalankan kegiatan-kegiatan diluar ketentuan-ketentuan yang telah ditetapkan sebagai tersebut diatas.
5. Setelah berakhirnya dilakukan tugas diwajibkan terlebih dahulu melaporkan kepada Pejabat Kecamatan/Kantor Instansi setempat mengenai selesainya pelaksanaan tugas tersebut sebelum meninggalkan daerah tempat dimaksud.
6. ***Setelah melakukan kegiatan diwajibkan/diharuskan untuk memberikan/ mengirimkan 1 buah hasil penelitian/ survey/ research, kepada Bupati Bojonegoro melalui Badan Kesatuan Bangsa, Politik dan Perlindungan Masyarakat Kab. Bojonegoro.***
7. *Surat ijin ini akan dicabut dan dinyatakan tidak berlaku apabila ternyata bahwa pemegang surat pengantar ini tidak memenuhi ketentuan tersebut diatas.*

Demikian untuk menjadikan maklum dan untuk dipegunakan sebagaimana mestinya.

Ditetapkan di : Bojonegoro
Pada tanggal : 28 Desember 2016

An.KEPALA BADAN KESATUAN BANGSA, POLITIK DAN PERLINDUNGAN MASYARAKAT
KABUPATEN BOJONEGORO
SEKRETARIS

Drs. MUJAYIN, M.M
Pembina Tingkat I

Disampaikan kepada :
1. Sdr. Kepala Dinas Kesehatan Kab. Bojonegoro
2. Sdr. Ketua Stikes ICSADA Bojonegoro
3. Yang bersangkutan

3. Permission letter to research ethics committee of Public Health Office in Bojonegoro District

PEMERINTAH KABUPATEN BOJONEGORO
DINAS KESEHATAN
JL. PANGLIMA SUDIRMAN NO. 30 TELP. (0353) 881350 FAX. 886695
BOJONEGORO
E-Mail adrres : Dinkes@Bojonegoro.Wasantara.Net.Id

Bojonegoro, 20 Desember 2016

Nomor : 440/ 6361 / 412.43 / 2016
Lampiran : -
Hal : Surat Pengantar Ijin Penelitian

Kepada :
Yth. Kepala Puskesmas Bojonegoro
Kepala Puskesmas Ngumpakdalem
Di -
BOJONEGORO

Menindaklanjuti Surat dari Badan Kesatuan Bangsa, Politik dan Perlindungan Masyarakat Pemerintah Kabupaten Bojonegoro Nomor: 072 / 636 / 204.412 / 2016 tanggal 28 Desember 2016 tentang Ijin Penelitian :

Nama	:	Angger Anugerah Hadi Sulistyo
NIM	:	091403048
Keperluan	:	Penelitian
Judul Penelitian	:	Efektifitas Foot Care Camp Terhadap Pengetahuan Dan Perilaku Perawatan Kaki Pada Penderita Diabetes Melitus Di Indonesia
Tempat Survei	:	Puskesmas Bojonegoro Puskesmas Ngumpakdalem
Waktu	:	29 Desember 2016 s/d 30 Februari 2017

Maka dengan ini kami mohon Saudara agar dapatnya membantu pelaksanaan kegiatan dimaksud. Setelah kegiatan penelitian tersebut berakhir, peneliti yang bersangkutan **diminta** untuk mengirim laporan hasil penelitiannya ke Seksi Pengkajian dan Penelitian Kesehatan Bidang PPSDK Dinas Kesehatan Kabupaten Bojonegoro. Data yang digunakan hanya untuk kepentingan penelitian akademis dan **bukan** untuk pergunakan kepentingan pihak yang lain.

Demikian atas perhatian dan bantuan Saudara disampaikan terima kasih

An. KEPALA DINAS KESEHATAN
KABUPATEN BOJONEGORO
Ka. Bid PPSDK

TOTOK ISMANTO, S.Pd.,M.Kes
PEMBINA
NIP. 19630324 198702 1 003

Tembusan :
- Yang bersangkutan
- Arsip

Vitae

Name Angger Anugerah Hadi Sulistyo

Student ID 5810420002

Educational Attainment

Degree	Name of Institution	Year of Graduation
Bachelor of Nursing	Jember University Jember, Indonesia	2013

Scholarship Award during Enrollment

Thailand's Education Hub for Southern Region of ASEAN (TEH-AC)

Scholarship, funded by graduate school, Prince of Songkla University, Thailand

Work Position and Address

Lecturer of surgical nursing department, ICSADA Health Science College,

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