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Diabetic Foot Ulcer Prevention: An Evidence Based Practice

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Abstract

Background: Diabetic foot ulcer (DFU) is one of diabetes mellitus complication that increases from year by year. There was 15% diabetes mellitus patients suffered DFU and around 50% DFU patients die within five years. This study aimed to develop the guidelines for preventing diabetic foot ulcer. Data collection was carried out from March to April 2017. There were 40 nurses included in this study which are working at IPD of city hospital in Pontianak, West Borneo, Indonesia.
Methods: Tools for data collection included guideline for DFU prevention and guideline manual for nurses, while tools for outcome evaluation included Nursing competency for DFU prevention form, Nurse Opinion Questionnaire and Nurse Agreement on Guideline. The content validity of the Nurse Opinion Questionnaire was 1.0 and Nursing Competency for DFU prevention was 1.0. The internal consistency of Nurse Agreement on Guideline using Cronbach's alpha was 0.89. Data analysis was performed using descriptive statistics.
Results: The guidelines of DFU prevention in DM patients who admitted into the hospital has been developed, and most nurses provided the expected response. Some nurses agreed and highly agreed with the guidelines.
Conclusions: The guidelines of DFU prevention are useful and important for nursing practice. Nurses can use the guidelines to protect and prevent their DM patient from diabetic foot ulcer or infection. In addition, some recommendations for nursing practice and further study were proposed.

Keywords: Diabetic foot ulcer; diabetic foot ulcer prevention; diabetic foot ulcer and diabetes mellitus

BACKGROUND

DFU affects quality of life, and it

increases morbidity and mortality, also incurs a substantial economic burden for society, patients and their families.[1]DFU increases from year by year.[2] There were 15% of DM patients who had DFU during their lifetime.[3] The prevalence of DFU in Indonesia is approximately 15%[4] and the incidents among DM patients are 29 times.[5]

The ideal treatment of DFU prevention includes regular foot inspection, risk foot assessment, transfers knowledge related risk for DFU and early detect risk of DFU, appropriate DFU intervention.[2]

The DM patients suffering from DFU need a long treatment period for wound healing process and it would expend the wound cost. The patients need to spend approximately 15 - 23 USD per visit. Additionally, the routine care is perceived lack of addressing the occurrence of DFU among DM patients. Nurses use diabetic foot risk category at DM clinic, but the guidelines for DFU prevention was not available. This study aimed to develop the guidelines for DFU prevention in DM patients. The guidelines for DFU prevention is very important because it would help nurses to early detect DFU in DM patients and it would save cost for DM patients if DFU can be prevented.

METHODS

This study design was based on the conceptualization of the Stetler model[6] of research utilization to facilitate evidence based practice. The Stetler model consists of preparation phase, validation phase, comparative evaluation/decision making phase, translation/application phase, and evaluation phase. Each phase guided the development of guidelines for DFU prevention. This study was conducted in an IPD of Province and city hospital Pontianak, West Borneo, Indonesia. Subsequently, 40 nurses were considered as target population for implemented the guideline. The study instruments consist of guidelines for DFU prevention, nursing competency for DFU prevention, nurse opinion questionnaire, and nurse agreement on guideline.

RESULTS

Demographic data of the nurses

The average age of the nurses who worked in IPD of provincial hospital was 30.4 (SD=5.5) years old and ranged from 24 to 43 years old. The average age of the nurses who worked in IPD of city hospital was 28.3 (SD=3.2) years old and ranged from 25 to 40 years old. 85% the nurses who worked in IPD of provincial were dominantly female whereas 60% nurses in IPD of city hospital were male. Most nurses from provincial hospital earned diploma degree (90%) whereas most nurses from city hospital earned bachelor degree (60%). In Provincial hospital, the average years of working experience with DM patients was 6.3 (SD=2.6). In city hospital, the average years of working experience with DM patients was 4.6 (SD=1.6). Only two nurses from provincial hospital had wound care certificate (10%) while eight nurses from city hospital had wound care certificate (40%).

Development of the guidelines for DFU prevention

Preparation phase. During preparation phase, goal of study had been determined. The goal was development of the guidelines for DFU prevention. The sufficiency findings of research articlessupported to reach of the goal.The articles were found in multiple sources including Cochrane, Pubmed, Cinahl, and Ovid by keywords such as diabetic foot ulcer/DFU, DFU prevention, risk assessment, diabetic risk category, and diabetic foot care.

*Validation phase.*19 research articles had been recruited, there were four research articles excluded. Using the guideline for research critique adapted from Melnyk and Fineout-Overholt,[8] the level evidence of articles had been analyzed and critiqued. Nine articles were level 1,[9-17]and 10 articles were level 4.[18-27].

Comparative evaluation/ decision making phase. In this phasethe research findings were drafted into guidelines for DFU prevention. Five nurses who expert in DM and DFU had analyzed and considered that the guidelines were practical. The guidelines can be seen in table 1-3.

Table 1 - Diabetic foot assessment

Components	Assessment

History	Duration of DM: ask the patient how long she or he has had DM
	History of ulceration and history of amputation: ask the patient about previous ulcer and assess the skin for signs of previous ulcer such as scars, Ask the patient about previous amputation and assess the skin for total toes and shape of foot for abnormalities
Physical examination	Neurological: Normal sensory can be indicated if the patient can feel the touching and giving pain on the feet and abnormal sensory can be indicated if the patient can not feel the touching and giving the pain on the feet
	Vascular (PAD/ PVD examination): Palpation dorsalis pedis and posterior tibial
	Dermatologic: Inspection formed callus and fissures
	Musculoskeletal: Inspection foot deformity such as hammer toe, claw toe, hallux valgus, hallux rigidus, pes planus, charcot, and limited joint mobility

Table 2 - Diabetic risk category (Level of Evidence IV)

Risk Categories		Definition
Low risk	Group 0	Absence of neuropathy or PVD
High risk	Group 1	Presence of Neuropathy, Absence of PVD or foot deformity
	Group 2	Presence diabetic neuropathy and foot deformity, PVD
	Group 3	Presence of Neuropathy + deformity History of DFU amputation

Table 3 - Diabetic foot care intervention

Risk Categories	Diabetic foot care intervention
Low risk (Group 0)	- Education Diabetic foot care 1. Daily feet inspection (injury, pain, color change, swelling, redness, breaks in the skin, etc.) including areas between the toes. 2. Regular washing of feet with careful drying, especially between the toes. 3. Advice on buying shoes: Shoes interior must be 1–2 cm longer than the foot. Low heels (<5 cm). Fasten shoes with lace to hold foot back in shoe, wearing socks reduces friction toes. 4. Demonstration of proper pedicure
High risk (Group 1)	- Education Diabetic foot care (Except no. 4) - Nurse demonstrate regular foot care and ask the patients to do demonstrate 1. Washing feet, cutting nails, removing callus 2. Use of creams for dry skin, tinea pedis and onychomycosis
Group 2	- Education Diabetic foot care (Except no. 4) - Nurse demonstrate regular foot care and ask the patients to do demonstrate 1. Washing feet, cutting nails, removing callus 2. Use of creams for dry skin, tinea pedis and onychomycosis - Vascularconsultation as needed: a cold, pink, painful foot is an indication of severe ischaemia and requires urgent vascular intervention

Group 3	- Education Diabetic foot care (Except no. 4) - Nurse demonstrate regular foot care and ask the patients to do demonstrate 1. Washing feet, cutting nails, removing callus 2. Use of creams for dry skin, tinea pedis and onychomycosis - Dermatology consultation as needed: When traumatic wounds progress to foot ulcer, requires urgent dermatology intervention and patient education on need for rest, regular dressings, early reporting of problems.

Translation/ application phase. All of the nurses involved in training how to apply the guideline. All nurses had ability in implementing the guidelines for DFU prevention in DM patients. There were 11 nurses (27.5%) who had good performance, they were four nurses from provincial hospital and seven nurses from city hospital. There were 23 nurses (57.5%) who had satisfaction performance; they were 12 nurses from provincial hospital and 11 nurses from city hospital. Unfortunately, there were six nurses (15%) who had poor performance; they were four nurses from provincial hospital and two nurses from city hospital. The nurses with poor performance were retrained until they passed and met the satisfaction level.

Evaluation phase. Nurses agreement and opinion on the guideline were assessed by questionnaire. The content validity of the Nurse Opinion Questionnaire was 1.0 and the internal consistency of Nurse Agreement on Guideline using Cronbach's alpha was 0.89. The agreement levels ranged from agree to strongly agree. There was only one nurse who disagreed on the statement number 11, which is advice on buying shoes for all categorized patients. Overall, most nurses agreed with all of the statements.The opinion levels ranged from agree to strongly agree.

Overall, all nurses agreed with all of the statements. Nurses considered for applying the guideline as routine care for preventing DM patient from DFU.

DISCUSSIONS

19 research articles were recruited and four research articles were excluded. Four research articles was excluded due to the year of published were very old. In previous chapter, the researcher has explained related criteria of literature study. Melnyk and Fineout-Overholt[8] views that valid articles for EBP should not use reference more than five years. However, Whitehead[29] argues that there is no definite about optimum range year of references. In this study, the researchers decided to choose references within 10 years with the reason that the content of the research articles are still applicable and relevant to current practice.

The result from evaluation of nurse agreement on the guidelines showed that most of the nurses agreed and strongly agreed with the guideline statements. Only one statement was rated disagreed by one nurse. Similarly, all nurses agreed with the guideline implementation. Nurses agree to decisions and actions for applying research findings when it provide especially strong evidence[30]. In the other hand, the statement "advice on buying shoes for all of categorized patients" was rated disagreed by one nurse. One possible explanation is that shoes provided for DM patients is not much available in Pontianak and its price is considerably expensive. Based on the experience of researchers, the store which sells shoes for DM in Pontianak is only in one store. According to Polit[30] nurses will consider and accept nursing intervention which is cost-effective and beneficial for patients.

CONCLUSION AND RECOMMENDATION

The guidelines for DFU prevention have been developed. The guideline is useful and significant for nursing practice. Nurse agree with all the guideline statements and guideline implementation. The researcher has not evaluated the DM patients after implementation of the guidelines for DFU prevention. Therefore, further study should evaluate the result of implementation of the guidelines for DFU prevention in DM patients.

DECLARATIONS

Authors' contributions

All authors meet at least one of the following criteria and have agreed on the final version: 1) substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; 2) drafting the article or revising it critically for important intellectual content.

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Ethics approval and consent to participate

The study protocol was approved by the Khon Kaen University Ethics Committee for Human Research based on Declaration of Helsinky and the ICH Good Clinical Practice Guidelines.

Consent for publication

Not applicable

Competing interests

The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported.

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