



RESEARCH ARTICLE

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## NURSE'S BEHAVIOR IN THE PREVENTIVE CARE PRACTICE REGARDING DIABETIC FOOT

<sup>1</sup>Maria Girlane Sousa Albuquerque Brandão, <sup>1</sup>Bruna Monik Morais de Oliveira, <sup>2</sup>Anne Fayma Lopes Chaves, <sup>2</sup>Alana Santos Monte, <sup>2</sup>Leilane Barbosa de Sousa, <sup>2</sup>Thiago Moura de Araújo and <sup>2</sup>Emília Soares Chaves Rouberte

<sup>1</sup>Nurse, Master student in Nursing, University of the Integration of Afro-Brazilian Lusophony (UNILAB), Nursing department, Redenção, Ceará, Brazil

<sup>2</sup>Doctor of Nursing, Teacher of the University of Integration of Afro-Brazilian Lusophony (UNILAB), Nursing department, Redenção, Ceará, Brazil

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### ABSTRACT

The objective of the study is to identify the practices of care for prevention of diabetic foot performed by the nurse. Integrative literature review in the databases: LILACS, SCIELO, BDNF, Cochrane Library and Web of Science. The inclusion of publications was followed by criteria such as: complete and free texts in Portuguese, English and Spanish, published between 2006 and 2019. Productions that did not attend to the guiding question of the study, letters to editors, theses, dissertations and annals, totaling a final sample of 16 articles. The analysis of the results of this study allowed the identification of 13 professional nursing care practices for the prevention of foot injuries in diabetic patients: Nursing Consultation, Health Education Groups and Activities, Foot Examination, Risk Stratification, Finding and Guiding Appropriate Footwear, To orient hygienic conditions and hydration of the feet, To evaluate and to guide the cut of the nails, To instigate the self-care, Use of educational technologies light-hard, To realize glycemic control, To guide proper nutrition, To guide the correct use of the medications and To instigate the practice of activities physics. The nurse practitioner performs several care practices that may decrease the risk of foot ulceration and instigate patient self-care.

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## INTRODUCTION

Diabetes Mellitus (DM) is a chronic non-communicable disease, which represents a global epidemic and a serious problem of public health, for being a source of morbidity and mortality (Flor; Campos, 2017). The DM is defined as a chronic disorder responsible for affecting glucose metabolism and other substances that provides energy, which commonly show hyperglycemia and arises from defects on insulin action and may develop a series of complications on vital organs and generate micro vascular issues, such as neuropathies, nephropathies and retinopathies, in addition to macro vascular problems, such as acute myocardial infarction, cerebral vascular accident and peripheral arterial diseases (Cubas et al., 2013; Mathur et al., 2017; Sales-Peres et al., 2016). According to the current estimates, 382 million individuals live with DM in the world and it may reach 592 million in 2035

(Guariguata et al., 2014). In Brazil, data from the National Health Research (NHR) estimates that around 9.2 millions of Brazilians have a diagnostic of diabetes mellitus (Iser et al., 2015). However, 24% of the patients with verified diagnostic of DM do not perform treatment. It is worth to highlight that 40-70% of the non-traumatic amputations of lower members are due to glycemic decompensation associated with diabetic foot (Feitosa et al., 2015). The diabetic foot is characterized as a neuropathic clinical co-morbidity, influenced by sustained hyperglycemia which results on deformities and ulceration of the foot, on skin or deeper plane, correlated to previous trauma and triggering infections (Chin et al., 2014). On diabetic patients that do not perform the treatment, issues on lower members may become a common problem. It is estimated that 15% of the individuals with DM develop diabetic foot, resulting on annual costs for the Single Health System (SUS) of around R\$ 18.2 million only with amputations.

Besides the hospital costs, there are indirect expenses, related to the loss of productivity and the psychological impacts for the patient and his family core (Bragança *et al.*, 2010; Morey-Vargas *et al.*, 2015; Salomé *et al.*, 2017). Therefore, it is imperative that the health professionals, especially the nurses, are alert to the prevention of DM and its complications, such as the diabetic foot. The nurse has a key function regarding the prevention of issues resulting from the DM via integral and holistic care, seeking to identify with high acuity the patients who show risk of ulceration on the feet (Brasil, 2011). However, studies accomplished in the South, Southeast and Northeast of Brazil highlighted deficits concerning the performance and knowledge of the nurse when facing preventive care of diabetic foot (Vargas *et al.*, 2017; Pereira *et al.*, 2017; Andrade *et al.*, 2010; Policarpo *et al.*, 2014). Against the nurse's value regarding the care to the person with DM, through his role of caregiver and educator, it becomes relevant to know how the nurses must act on the prevention of diabetic foot (Oliveira *et al.*, 2016). Consequently, the study devolves into something significant for giving the nurse the knowledge of his competences concerning preventive care practices of the diabetic foot, opening ways for the reflection about the care improvement among their patients, as a way to avoid future complications, such as the diabetic foot or amputation. The study has as purpose to identify the care practices for prevention of the diabetic foot that must be made by nurses.

## MATERIALS AND METHODS

It is about an integrative review of the literature, which pursued to identify, select and analyze the scientific production regarding the nurse's behavior in the preventive care practices of feet injuries on diabetic patients. The bibliographic investigation was made on April, 2019. To gather the data, the acronym PICO was used. This strategy helps the researchers to establish the study's guiding question and allows a better identification of key-words, which collaborates on pinpointing relevant studies inside the database (Fineout-Overholt; Stillwell, 2010). In that regard, this study's guiding question, adjusted by the PICO strategy, is: "What are the care practices for the prevention of diabetic foot used by the nurses?". The following conditions were used for the publications inclusion: complete and free of charge texts written in Portuguese, English and Spanish, published between 2006 and 2019. The justification for the time lapse used is because the decree nº 648, published on March of 2006, that approved the National Politic of Basic care (Brazil), established that the team, especially the nurse, is responsible for the assurance of integral care of the diabetic patient, through an effective evaluation and planning of interventions and health care practices, seeking, therefore, to analyze the scientific production after this decree's publication up to the present moment (Brasil, 2006). The following database was used: Literature Latin American and Caribbean Health Sciences Literature (LILACS), Scientific Electronic Library Online (SCIELO), Nursing database (BDENF), Cochrane Library and Web of Science, directly available on their websites or via Capes Portal. The productions that did not meet the study's guiding question were excluded. The adopted research strategy was the use of descriptors and the Boolean operator "AND". The selected descriptors also used the PICO strategy and were identified through the use of DEC and MeSH: Nursing and Prevention and Diabetic foot. To analyze the articles' level of evidence, six levels of evidence were considered: I – evidences that

resulted from meta-analysis of controlled and randomized multiple clinical studies; II – evidences of individual studies with experimental delineation; III – evidences of quasi-experimental studies; IV – evidences of descriptive studies (non experimental) or with qualitative approach; V – evidences coming from case reports or experience; VI – evidences bases on specialists' opinions (Melnik; Fineout-Overholt, 2011). To organize this strategy's result, a computer program was used (WordArt version 4.5.1) that makes clouds of words, arranging them, on several colors and sizes, based on the number of made mentions inside the articles. Therefore, in the cloud, the size of each word is represented by the recommendation level (Prais; Rosa, 2017).

## RESULTS

140 articles were identified inside the five consulted database. After the survey of publications, the titles and abstracts were read and categorized accordingly to the pre established inclusion and exclusion conditions, totaling a final sample of 16 articles, in accordance with Figure 1. One perceives, that regarding the publication year of the 16 studies included in this integrative review, the year of 2014 stands out, with five studies, and the database Web of Science and LILACS, each one with five article (Chart 1). Regarding the level of evidence, studies classified as level IV (14) prevailed, where the achieved results are derived from a single descriptive or qualitative study, being possible to infer that the nurse still do not dispose of scientific researches that bring strong evidences related to the Nursing clinical care offered to people with DM. The figure 2 represents the care practices against the number of mentions made in the articles. Therefore, in the cloud, the size of each word is represented by the level of recommendation. Therefore, one perceives, the highlight of care actions associated to the promotion of groups and activities on health education, nursing appointment, accomplishment of glycemic controls of the patients with DM and feet exam, analysis and guidance regarding the most adequate shoes, in additions to conditions of hygiene and hydration of the feet and to stimulation of learning selfcare.

## DISCUSSION

The ensuing results of this integrative review infers that the prevention of feet ulceration is a relevant theme in the field of public health and has been a debate focus by several professionals. On this scenario of preventive practices of diabetic foot, there is spotlight for the nurse's actuation, via direct contact of this professional with diabetic patients, specially on the context of Strategy of Family Health, which must implement educative actions of awareness and sensitization of the population about the prevention of diabetic foot and other issues of DM. In the evaluation of the included studies, there was an emphasis for the Groups and activities of health education, characterized as an important tool that enables the nursing professional to develop educative activities and implement strategies that may favor the adhesion of people to the treatments and relevant care practices to prevent issues arising from the DM. The studies point out that activities and groups of health education provides the prevention of diabetic foot and the promotion of health, in addition to promoting the establishment of a bond between nurse and client, through a space of collective knowledge construction that stimulates the people with DM to have positive attitudes in regard to the health and to be protagonists of their own care (Oliveira *et al.*, 2016; Vargas *et al.*, 2017;

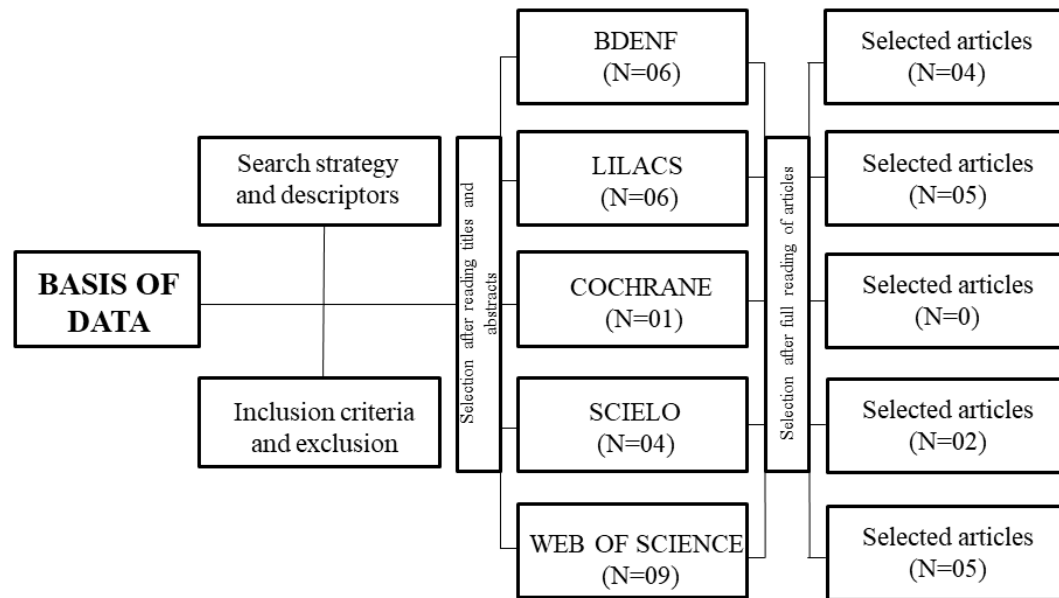


Figure 1. Graphic diagram of the methodological process to select the studies. Redenção (State of Ceará), Brazil, 2019

Chart 1. Description of the studies included in the integrative review. Redenção (State of Ceará), Brazil, 2019

N°	Title	Objetivet	Authors/ year	Database/ Level of evidence	Periodic
01	Actions of the Nurses from the primary care attention on people with diabetic foot.	To know the actions of nurses from the primary care attention on people with Diabetes Mellitus (DM) concerning the diabetic foot.	Vargas <i>et al.</i> , 2017	BDENF Level IV	Revista de Enfermagem UFPE
02	Actions of the nurse concerning the prevention of diabetic foot: The point of view of the patient with diabetes mellitus.	To investigate the actions made by the nurse concerning the prevention of the diabetic foot regarding the point of view of the patient with diabetes mellitus.	Pereira <i>et al.</i> , 2017	BDENF Level IV	Revista Pesquisa Cuidado é fundamental
03	Changes on the feet of hospitalized elderly people: A careful view of nursing.	To characterize the podiatric profile of hospitalized elderly people on nursing rooms of university hospitals and to analyze the nurse's acting possibilities among these elders.	Silva <i>et al.</i> , 2017	BDENF Level IV	Revista Escola Anna Nery
04	Actions from the Nurses of family health strategy concerning the prevention of diabetic foot.	To identify the guidelines provided by nurses to people with DM concerning their feet's care.	Oliveira <i>et al.</i> , 2016	BDENF Level IV	Revista Pesquisa Cuidado é fundamental
05	Knowledge and practices for the prevention of diabetic foot.	To describe the problems and the accomplished practices for the prevention of diabetic foot.	Ramirez-Perdomo <i>et al.</i> , 2019	LILACS Level IV	Revista Gaúcha de Enfermagem
06	Knowledge about the prevention of the diabetic foot: an integrative literature review.	To Systematize the nurse's knowledge about prevention of diabetic foot.	Sousa <i>et al.</i> , 2017	LILACS Level V	Revista Brasileira em Promoção da Saúde
07	Health promotion of people with diabetes mellitus concerning the educative preventive care of diabetic foot.	To know the results of interventionist actions of education on health concerning the prevention of diabetic foot.	Silva <i>et al.</i> , 2016	LILACS Level IV	Ciencia y enfermería

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08	Education regarding health, prevention and care to the diabetic foot: an experience report.	To report the lived experience on the accomplishment of educative actions regarding the care of the diabetic foot.	Couto <i>et al.</i> , 2014	LILACS Level V	Revista Baiana de Saúde Pública
09	Nursing clinical approach on the prevention of diabetic foot.	To identify the used conducts during a nursing appointment of the individual with diabetes mellitus, concerning the prevention of diabetic foot.	Pereira <i>et al.</i> , 2014	LILACS Level IV	Revista Brasileira em Promoção da Saúde
10	Knowledge, attitudes and practices for the prevention of diabetic foot.	To identify the knowledge, attitude and practices guided toward the prevention of diabetic foot on patients with diabetes mellitus type 2.	Policarpo <i>et al.</i> , 2014	SCIELO Level IV	Revista Gaúcha de Enfermagem
11	Diabetic foot and the risk evaluation of ulceration.	To update the knowledge about the problematic of diabetic foot, prevention, referral and treatment.	Silva <i>et al.</i> , 2014	SCIELO Level V	Revista de Enfermagem Referência
12	The effect of a foot care camp on diabetic foot care knowledge and the behaviors of individuals with diabetes mellitus.	To examine the effectiveness of feet care among diabetic participants on Indonesia.	Sulistyoe <i>et al.</i> , 2018	WEB OF SCIENCE Level III	Journal of research in nursing
13	Preventing and managing diabetic foot ulcers: application of Orem's self-care model.	To investigate deficit theory application of Orem's self-care model concerning the prevention and handling of the diabetic foot's ulcer.	Maslakpaket <i>al.</i> , 2018	WEB OF SCIENCE Level III	International Journal of Diabetes in developing countries
14	Diabetic foot ulcers Part I. Path physiology and prevention.	To identify the high risk diabetic foot and outline strategies for the prevention of diabetic foot ulcer.	Alaviyet <i>al.</i> , 2014	WEB OF SCIENCE Level IV	Journal of the American Academy of Dermatology
15	Preventing the First or Recurrent Ulcers.	To review the current evidences to prevent diabetic foot ulceration.	Lavery <i>et al.</i> , 2013	WEB OF SCIENCE Level IV	Medical Clinics of North America
16	Best practice in the assessment and management of diabetic foot ulcers.	To analyze prevention evidences and evaluation risks of diabetic foot by nurses.	Delmas <i>et al.</i> , 2006	WEB OF SCIENCE Level IV	Rehabilitation Nursing

Source: Research data, 2019.

The analysis of this study's results allowed to identify 13 care practices that a responsibility of the nursing professional for the prevention of injuries in the feet of diabetic patients (Chart 2).

**Chart 3. An overview of the identified care practices concerning the nurse's actuation, implication for the prevention and the articles that approached each practice, selected by the following database sequence: BDEF, LILACS, SCIELO and WEB OF SCIENCE. Redenção (State of Ceara), Brazil, 2019**

Care practice	Practice's implication for the prevention	Articles that approach the practice on how to do of the nurse
Nursing appointment	The nursing appointment is vital for the nurse to meet and evaluate the patient and his current and previous history, social and economic context, education level, to measure their potentiality and capacity of selfcare e to develop their care plan for the prevention of diabetic foot.	1, 2, 3,7, 9, 10, 16
Groups and health education activities	The groups and health education activities with diabetic patients are a tool of great relevance for the nurses, especially in the Basic Attention field, because they enable the swap of collective knowledge and helps the professional in the pursue of orientations concerning the presented fragilities,	1, 2, 4, 5,7, 9,10,11,12,15, 16
Feet exam	The feet exam is one of the main care practices to prevent the occurrence of injuries by diabetic foot and must be daily accomplished by the nurse and/or medico n Basic Attention. The examination of the patient's feet may reduce issues, on moments where the presence of the following conditions must be evaluated: presence of deformities, skin rupture and/or hyperextension of joints and loss of sensibility.	1, 2, 3, 7,8, 9,10,11,14,16
Risk stratification	The risk stratification of patients with diabetes may allow the nurse to identify clients with a higher risk of developing feet injuries and to anticipate a plan of care and interventions that will prevent the appearance of this kind of injury on the lower member.	1,10,11,15
To assure and orient the use of proper shoes	Diabetic patients must carefully choose the shoes. If chosen wrong, there may be a risk of injuries and alterations on the skin. The diabetic feet present characteristics such as the reduction of sensibility, claw toes, issues on the blood circulation, muscular and joints debility. The nurse, therefore, must assure and orient the use of proper shoes that offers comfort and protections for the patient's feet.	1, 3, 4, 6, 9,10,11, 15

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To orient proper hygiene and hydration of the feet	It is fundamental to orient the patient in regard to the feet cleaning, which must be washed with warm water and neutral soap, correctly drying between fingers, as a way to prevent the appearance of fungus and mycosis, as well as to hydrate the feet to avoid dryness, fissures and cracks.	1, 2, 4,6,7,9,10
To evaluate and guide the fingernail cutting	Fingernails correctly cut, in a horizontal way, not too close to the skin, will avoid the appearance of infections and/or bad nails. That may unleash injuries.	1,4, 6,7,9,10,11
To stimulate the self care	The nurse's orientations must also be guided toward the practice of selfcare, with the purpose of enabling a higher control and stability of the disease for the diabetic patient, since it will minimize the occurrence of issues.	2, 3, 5, 6,7,10,12,13,16
Use of soft-hard educative technologies	The use of videos, photos, series, banners, folders and other audiovisual devices are an innovative strategy that may sensitize and form knowledge and abilities concerning the disease's handling and the prevention of issues such as the diabetic foot.	3
To accomplish a glycemic control	The intensive glycemic control significantly reduces the risk of issues such as diabetic foot, which may occur when the blood circulation is deficient and the glycemia levels are badly controlled.	4,6,12,13
To orient an adequate nutrition	Diabetic patients must be instructed to have a balanced, varied and complete feeding, such as the consumption of horticultural, fruits, cereal and legumes. Although the diabetic are not absolutely prohibited of consuming sugar or sugary foods, it is worth to highlight that these type of foods, in addition to contribute with a rapid ascent of glycemia (sugar in the blood), they also presents, normally, a high caloric density, and, simultaneously, deficits of fibers, vitamins and minerals.	4,6
To orient the correct use of medications	The pharmacological treatment associated with a healthy lifestyle will make the patients obtain glycemic values always close to normality, minimizing the possibility of complications.	4
To stimulate the practice of physical activities	For the diabetic patient, physical activities such as walking, swimming, dance or cycling are excellent, because they use oxygen on their reactions and favors the burning of glycoses and fat.	4,6



Source: Research data, 2019.

Figure 2. Cloud with the care practices accordingly to the recomendations intensity in the articles as practices to prevent diabetic foot. Redenção (State of Ceara), Brasil, 2019.

Silva *et al.*, 2016; Pereira *et al.*, 2013). For the establishment of health education groups, the nursing appointment is fundamental, because it is through the consultation that the nurse is able to know the patient's current and previous history, makes the analysis of their social and economical context, get to know the patient's level of education and their conditions of health and hygiene. This way, the nurse becomes fundamental for the stimulation and support to the individual with DM, at the development of their preventive care plan in regard to DM issues, such as feet ulcerations (Vargas *et al.*, 2017). In addition to this, in all nursing appointments one must accomplish the feet exam on people with DM in great detail (Vargas *et al.*, 2017; Oliveira *et al.*, 2016; Silva *et al.*, 2016; Silva *et al.*, 2014). The nurse, as the responsible professional for the technique-scientific care, must strengthen their bonds with diabetic patients and accomplish a careful physical exam, that may clarify possible risks for the development of feet problems and still be able to support these problems at their base, avoiding bigger complications, such as the appearance of ulcerations and amputations (Silva; Santo; Chibante, 2017). Consequently, the nurse is the professional responsible for the identification and stratification of the risks regarding feet ulceration on diabetic patients.

During the feet exam, the nurse must assure and orient the use of proper shoes, hygiene conditions, feet hydration and the correct cut of the fingernails (Vargas *et al.*, 2017; Oliveira *et al.*, 2016; Policarpo *et al.*, 2014). The shoes observation and the orientation to use therapeutic shoes for diabetic clients is one of the most important factors that must be told by the nurses for prevent injuries on lower members, since, inadequate shoes exposes the feet to extrinsic trauma and may act as a triggering factor on up to 85% of feet ulceration cases (Costa *et al.*, 2012). Therefore, it is indispensable that the nurse is aware to the shoes used by the diabetic patients on daily routines, focusing on security and comfort, in addition to highlight the importance of not walking barefoot. Another significant point that the nurse must oversee and guide the diabetic patient is the care with their fingernails, which must be cut in a horizontal way to avoid injuries (Oliveira *et al.*, 2016; Vargas *et al.*, 2017; Pereira *et al.*, 2013). A study accomplished in Minas Gerais identified that 72% of the diabetic patients cut their fingernails in the wrong way (Bezerra *et al.*, 2008).

This care practice, although It seem very simple, is a strategy that may avoid injuries that can trigger wounds of difficult healing due to the DM. Another target of recommendations is that the nurses accomplish orientations regarding the cleaning and hydration of the feet, that must be made every day in an adequate way (Oliveira *et al.*, 2016; Policarpo *et al.*, 2014, Silva *et al.*, 2016). The adequate feet hygiene prevents the appearance of mycosis and infections and possible framework of widespread infection. The feet hydration also is another relevant guidance, since the diabetic patients may have a commitment of the sensitive, motor and autonomic fibers, which reduce the transpiration on the feet, leaving them dry and susceptible to cracks and fissures, maximizing the risk of injuries (Chaves *et al.*, 2013). Therefore, one perceives, that maintaining the feet clean and hydrated, specially between fingers, are care practices that may contribute to the prevention of risk factors for bigger feet injuries. To make the preventive practices of diabetic foot a success, it is indispensable that the nurse sensitizes the patient about the relevance of selfcare (Maslampak *et al.*, 2018; Oliveira *et al.*, 2016; Vargas *et al.*,

2017, Silva; Santo; Chibante, 2017). The nurse must stimulate the patient to develop a proactive posture in relation to their selfcare on all phases of the educational process, developing knowledge and skills that orchestrate themselves for their selfcare, assuming the responsibility of the therapeutic role in their life (Kuhnke *et al.*, 2014). For that reason, the nurse becomes a main stone for the stimulation and support of the individual with DM, on the development of their selfcare and the success of preventive care practices regarding the diabetic foot. It is still worth to highlight the importance of the nurse being aware to the diabetic patients' glycemic control (Vargas *et al.*, 2017; Silva *et al.*, 2016; Pereira *et al.*, 2013), because, in case they are not able to maintain the glycoses rates on favorable levels (inferior to 99 mg/dl), they will be more susceptible for the appearance of chronic complications derived from the DM. for the glycemic control, the nurse must highlight the need of changes in the patient's lifestyle, having an adequate nutrition, with therapeutic medications (when needed) and to stimulate the practice of physical activities at least three times a week.

The nurses that gives guidance for diabetic patients about the importance of having an balanced healthy feeding, rich on fruits and greenery, of practicing weekly physical activities, starting with soft exercises and properly using the medications when needed, will be directly contributing for the maintenance of their patients' glycemic control, as a way to prevent the appearance of injuries on lower members (Andrade *et al.*, 2010). In face of what has been exposed, one infers that this integrative review adds relevant information about the theme regarding the nurse's actions concerning preventive care practices of diabetic foot, through the amplification of basic actions directed to the diabetes' care and, specially, in regard to feet injuries. The care practices highlighted in the studies may, cooperate to prevent the appearance of such injuries on lower members, reducing the risk of amputations. However, it is worth to highlight the need from the health services to offer the nurse an adequate infrastructure and capacitation regarding the theme to foment preventive actions of high quality.

## Conclusion

One concludes that the care practices for the prevention of diabetic foot accomplished by the nurse are: the nursing appointment, groups and activities of health education, early identification of risk factors, care with adequate shoes, conditions of hydration and cleaning of the feet, correct cut of the fingernails, adequate nutrition, glycemic control and correlated medications associated with practice of physical activities and promotion of selfcare. Therefore, such preventive care practices accomplished by the nurse may permeate a satisfactory and integral prevention for the diabetic foot and may also reduce other micro and macro vascular complications derived from the DM.

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