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## Ficha de avaliação clínica de membros inferiores para prevenção do pé diabético

Clinical evaluation form of lower members for diabetic foot prevention

Ficha de avaliação clínica de membros inferiores para prevenção do pé diabético

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## ABSTRACT

**Objective:** To elaborate a clinical evaluation sheet (CES) of the lower limbs (LL) for diabetic foot (DF) prevention.

**Methods:** Based on literature review, a four-phased CES has been elaborated: phases 1 and 2 contemplate clinical evaluation (anamnesis and physical evaluation, respectively) with emphasis on feet evaluation and search for soreness risk factors; phase 3 evaluates feet care and phase 4 describes the main guidelines for this care. **Results:** With the completion of phases 1 and 2, a feet soreness risk rating follows. Phase 3 evaluates feet care with ten questions and phase 4 presents ten educational guidelines for DF prevention. **Conclusion:** The proposed CES enables the detection and early intervention on foot soreness risk.

**Descriptors:** Diabetic Foot, Diabetic Neuropathy, Peripheral Vascular Disease, Prevention, Feet Care.

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## RESUMO

**Objetivo:** Elaborar ficha de avaliação clínica (FAC) dos membros inferiores (MIs) para prevenção do pé diabético (PD). **Métodos:** Partindo de revisão da literatura, elaborou-se uma FAC com 4 fases: as fases 1 e 2 contemplam o exame clínico (anamnese e exame físico, respectivamente) com ênfase na avaliação dos pés e na pesquisa de fatores de risco para úlceras; a fase 3 avalia o autocuidado com os pés e a fase 4 descreve as principais orientações para este cuidado. **Resultados:** Após a realização das fases 1 e 2, segue uma classificação de risco de ulceração dos pés. A fase 3 avalia com dez questões os cuidados com os pés e a fase 4 apresenta dez orientações educacionais para prevenção do PD. **Conclusão:** A FAC proposta possibilita detectar e intervir precocemente no risco de ulceração nos pés.

**Descritores:** Pé Diabético; Neuropatia Diabética; Doença Vascular Periférica; Prevenção; Cuidado Com os Pés.

## RESUMEN

**Objetivo:** Desarrollar formulario de evaluación clínica (FEC) de los miembros inferiores (MIs) para la prevención del pie diabético (PD).

**Métodos:** A partir de la revisión de la literatura, fue preparada una FEC con 4 fases: fases 1 y 2 incluyen examen clínico (anamnesis y la exploración física, respectivamente), con énfasis en la evaluación de los pies y los factores de riesgo para buscar úlceras; fase 3 se evalúa el autocuidado con sus pies y la fase 4 se describen las pautas principales para este tipo de atención. **Resultados:** Después de la terminación de las fases 1 y 2 sigue la clasificación de riesgo de la ulceração de los pies. Fase 3 evalúa con diez preguntas del cuidado de los pies y la fase 4 presenta diez directrices educativas para prevenir el PD. **Conclusión:** La propuesta FEC permite detectar e intervenir temprano en riesgo de ulceração de los pies.

**Descriptores:** El Pie Diabético; La Neuropatía Diabética; Enfermedad Vascular Periférica; Prevención; Cuidado de Los Pies.

## INTRODUCTION

Diabetes Mellitus (DM) is one of the main public health problems in Brazil and the world, and its prevalence has been increasing due to the increase in life expectancy. In developing countries, unlike European countries and the United States, It is estimated that such increase occurs in all age groups and not only in the more advanced ones. Thus, it is evident the need to implement public health policies to improve the quality of life of individuals affected and their families, since this pathology is considered a Primary Care Condition, where the appropriate approach by Primary Care allows avoiding hospitalizations and deaths due to their complications.<sup>1</sup> In addition, DM is among the leading causes of global morbidity and mortality, being considered an epidemic worldwide nowadays.<sup>2</sup>

DM is a group of chronic noncommunicable diseases and is associated, in the long term, with micro and macrovascular complications, which compromise the productivity, quality and life expectancy of this clientele.<sup>3</sup> Diabetic microangiopathy causes diabetic retinopathy, nephropathy and neuropathy while macroangiopathy is responsible for the onset of cardiovascular diseases, including peripheral

obstructive arterial disease (PAOD). Cardiovascular disease is the main cause of mortality in diabetes mellitus.<sup>4-5</sup>

Diabetic foot is a name widely used in medical practice to refer to changes in feet resulting from chronic complications of diabetes and other associated changes.<sup>6</sup> The diabetic foot (structure of the ankle or below) usually presents with infection, ulceration and/or destruction of deep tissue associated with neurological abnormalities and various degrees of peripheral vascular disease in the lower limb. It has a multifactorial etiology and its triggering factors include sensorimotor and autonomic neuropathy, PAOD and infection.<sup>6-8</sup>

Diabetic neuropathy (DN), predominantly characterized by sensitivity impairment, constitutes the major risk factor for the appearance of foot ulcers that can lead to amputation.<sup>9-10</sup> It manifests after about 15 years of the diagnosis of DM, and its prevalence reaches 40%.<sup>11</sup> Sensory-motor and autonomic neuropathy, PAOD, limitation of joint movement with abnormal distribution of the mechanical forces of the feet and trophic disorders of the skin are factors implicated in the etiopathogenesis of ulcers.<sup>12</sup>

The most frequent cause of hospital admissions among diabetic patients is related to foot ulcers, whose estimated prevalence is 1.4% to 11.9%. Foot ulcers affect about 15% of patients with diabetes throughout their lives in Brazil.<sup>8</sup> It is estimated that the frequency of amputation in diabetic people is 10 to 30 times higher than in the general population.<sup>13</sup>

The diabetic foot can lead to non-traumatic amputations, which represent one of the most devastating problems associated with the disease, causing great impact in personal life, in the family and socioeconomic level, with commitment of the individual's self-image and loss of productive capacity, which demonstrates unequivocally the importance of the implantation of preventive measures of the diabetic foot in the DM.<sup>6-7,14</sup>

In developed countries amputation results more frequently from the association between PAOD and ND, whereas in developing countries infection is still the most common complication of ulcers that will result in amputation.<sup>8</sup> About 10% to 25% of diabetics over 70 years old will have lesions on the lower limbs, of which 14% to 24% will suffer amputation.<sup>9</sup>

There is some evidence that diabetic foot complications can be prevented.<sup>15</sup> Therefore, it is necessary to control blood pressure levels, serum lipid and glucose levels, stimulate physical activity and weight control, as well as guidelines on the importance of smoking cessation and alcoholism.<sup>6</sup> The information, awareness and education of the patient for self-care, to ensure adherence to diabetes treatment, as well as close collaboration between health professionals and patients, are essential elements to avoid the development of these complications in order to identify real and potential foot problems.<sup>3,16</sup>

It is reported that an approach that includes close monitoring of the patient among other measures can reduce

the amputation rates in 49% to 85%.<sup>10</sup> This article aims to propose a clinical evaluation form (CEF) of the lower limbs (LLs) for the prevention of diabetic foot (DF) (Figure 1), as a facilitating tool for application by health professionals or students in this area duly trained in services that are intended to care for the individual with DM. It was developed with the purpose of guiding the identification and classification of the patient at risk, evaluating and guiding the education of the patient and his family for self-care with the feet.

## METHODS

This work resulted from a review of the literature on the Virtual Health Library (VHL), periodicals indexed in the electronic databases MEDLINE and LILACS, as well as textbooks related to the subject, published in Portuguese and/or English, covering the period from 1999 to 2015. As descriptors were used: “Pé Diabético” (“Diabetic Foot”), “Fatores De Risco” (“Risk Factors”), “Neuropatia Diabética” (“Diabetic Neuropathy”), “Doença Vascul Periférica” (“Peripheral Vascular Disease”), “Prevenção & Controle” (“Prevention & Control”) E “Autocuidado Com Os Pés” (“Foot Self-care”).

The inclusion criteria of the articles consisted of studies related to the risk factors for diabetic foot and the clinical evaluation of diabetic patients, which addressed the methods of evaluation of neuropathy and peripheral vascular disease, especially those that aimed to identify and classify the foot in risk of people with DM.

After reviewing the literature, a preliminary study of the material was carried out, from which the texts that served as basis for the elaboration of a proposal for an CES were selected, aiming at the development of the systematization of care by the health professional to the patient with DM, in order to prevent the appearance of ulcers and other changes that make up the diabetic foot.

The CES uses the interview technique to complete a semi-structured questionnaire (phases 1 and 3), records general and specific physical examination data (phase 2) and, in the end, systematically describes the main educational guidelines to prevent DF (phase 4).

This fact sheet is based on: (A) identifying risk factors for foot ulceration through anamnesis and physical examination and, based on the results obtained, classifying the patient as to the risk of such complication (phases 1 and 2); (B) assessing adherence to preventive measures of DF, ie whether knowledge about preventive foot care is being applied (phase 3) and; (C) presenting the main educational guidelines that should be followed by patients for prevention of DF (phase 4).

## RESULTS

### Phase 1 – Anamnesis

This initial part of the clinical file seeks, through a semi-structured questionnaire, to identify risk factors cited in the literature as being associated directly or indirectly with the development of foot ulcers. To do so, the elements of the anamnesis considered were patient identification and risk factors for the development of foot ulcers, personal and family history of DM and associated diseases, and an investigation of clinical symptoms directed to the presence of diabetic neuropathy (DN) and peripheral obstructive arterial disease (PAD) in the lower limbs (legs and feet).

### Phase 2 - Clinical examination and risk classification of diabetic foot

Phase 2 includes general and specific evaluations (ectoscopic, physical and instrumental evaluations of the vascular and peripheral nerves of the lower limbs) for clinical examination. The general evaluations include an anthropometric evaluation (weight, height, body mass index); blood pressure measurement, dermatological evaluation of the feet (skin and faneros) and osteoarticular evaluation. Specific evaluations (vascular and neurological) will then be performed.

Vascular evaluation proposes the palpation of peripheral tibial and posterior pedal pulses and ankle-brachial index (ABI) measurements performed in both limbs, and the results should be indicated in predetermined fields. The neurological assessment of the feet will be based on the evaluation of the pain sensations, superficial and thermal tactile sensations, as well as evaluation of the foot mobility where the interosseous muscles, the gait and the Aquileu reflex will be evaluated.

The pressure sensation will also be evaluated with the 10g monofilament (Semmes-Weinstein monofilament test) and the vibration sensitivity with the 128 Hz tuning fork. Based on the results obtained, the risk of foot ulceration will be assessed and the metabolic control by the glycated hemoglobin levels of the last three exams.

### Phase 3 - Assessment of self-care with feet

Phase 3 lists a series of 10 questions that assess the patient's self-care at his or her feet. It addresses foot inspection, the use of appropriate socks and shoes, hygiene and hydration of the feet, nail care and the prevention of injury. This evaluation should be repeated at each visit to measure how much the diabetic patient is applying these preventive measures in their daily routine.

## Phase 4 - Patient guidelines for foot care

At this stage, the main guidelines to be followed by patients to prevent diabetic foot are detailed. These guidelines consist of simple actions often performed by patients. They are mentioned below in a didactic way, in topics and include some signs and symptoms of alertness so that the patient immediately seeks professionals from the health team for the adoption of appropriate actions in the case in question.

1. Daily foot inspection: the feet (plant and back) should be inspected DAILY, looking for small wounds, blisters or calluses, red spots, nail changes, finger injuries, bony prominences, and changes in shape, color and temperature of the feet. The inspection must necessarily include the sole of the feet and it will often be necessary to use a mirror or, in the case of visual impairment, it must be performed by family members or third parties.<sup>10,17-18</sup>
2. Wash your feet every day: use warm water (never hot) and mild soap and do not leave your feet soaking. Dry them thoroughly with a soft dry towel, without rubbing the skin, thoroughly wiping the skin between the fingers.<sup>10,17-18</sup>
3. Hydration of the feet: use oils or moisturizing creams to prevent the skin from becoming dry, taking care not to apply them between the toes or in areas where there are open wounds or cracks. Never use talcum powder in the feet, as it causes dryness and thus predisposes the appearance of lesions.<sup>10,17-18</sup>
4. Always wear clean socks: even in the home. Wear clean socks (change daily), comfortable, without seams, and preferably cotton, lighter color or white, as it facilitates the identification of possible injuries.<sup>10,17</sup>
5. Shoes: should not have internal seams, should be deep enough so that an appropriate removable insole can be accommodated, preferably with internal padding and adjustable closure (velcro or shoelace). Square-tipped footwear is recommended for a better fit of the toes and heels will be no more than 3 cm. They should fully cover the toes and heel and be made preferably of soft leather or canvas. These specifications allow a reduction of areas of plantar pressure and friction, and facilitate the accommodation of deformities, if present. Do not wear shoes without socks. In the summer, slippers may be worn as long, as they do not have a strap between the toes, that are hardy and soft and will be used early in the morning on leaving the bed.<sup>10,17-18</sup>
6. New shoes: should be used gradually. Use them in the first few days only at home for a maximum of two hours.<sup>19</sup>
7. Never walk barefoot: Shoes should always be shaken and palpated before use to prevent objects inside

the shoes from injuring feet, which often have a sensitivity change.<sup>10,17</sup>

8. Nail cutting: should always be cut straight and not too close, preferably after bath (when they are soft), with rounded tip scissors in a well-lit environment. The straight cut is indicated due to the less possibility of injury in the corners of the fingers. Do not try to cut nail ingrown, in this situation a specialist should be consulted. In cases where there is a vision problem you should ask for help of another person to cut the nails.<sup>10,17-18,20</sup>
9. Callosities: Do not remove the callosities by applying any type of chemical agent or plaster. Seek professional treatment.<sup>10,18</sup>
10. Immediately contact your health care professional: in the event of open wounds, blisters, pain in the legs when walking or cold and numb legs with pale or blue coloring, or lesions in the regions between the toes and/or soles of the feet suggestive of "Athlete's foot" (represented by redness, fissures, peeling, blisters and usually accompanied by itching).<sup>17</sup>

## DISCUSSION

The purpose of this article was to elaborate a clinical assessment sheet for LLs for diabetic patients, seeking objectivity and efficiency in evaluations to identify and classify patients at risk of foot ulceration, as well as to include in this instrument relevant educational guidelines for care with the feet ensuring that these are passed on to the patient and his family. The complete file must be completed annually; however, phases 3 and 4, regarding foot care, should be applied at each visit, until certainty of its incorporation into daily practice and from that moment the evaluation will be periodic until, in at least once a year at the time of the full evaluation.

The prevention of lower limb amputation in diabetics is based on the identification and classification of the risk of ulceration, early treatment and the adoption of educational measures.<sup>6</sup> The proposed FAC, supported in the literature, is directed to health professionals who take care of diabetics to apply in their clinical practice, in their different places of action. Its phased structure allows a better organization of information and data collected facilitating clinical follow-up.

One of the first concerns in the evaluation of diabetic feet is the identification of risk factors for ulceration, which is contemplated in the initial part of the proposed file (phase 1), since, as mentioned in the literature, many risk factors for ulceration/amputation can be discovered by means of anamnesis, asking themselves about risk factors for diabetic neuropathy and atherosclerosis (which is largely responsible for peripheral obstructive arterial disease), while others will be revealed by the clinical signs and symptoms presented at the clinical examination of LLs, in particular, by careful clinical examination of the patient's feet, since various skin



changes, callosities, decreased sensitivity among others may not be perceived by patients.

Thus, in phase 1, we intend to identify risk factors that may influence the development of diabetic foot, such as: advanced age (over 60 years); low education level; low socioeconomic status, living alone, type 2 diabetes mellitus; long duration of the disease (more than 10 years of DM diagnosis); personal and family history of other chronic complications of diabetes, and other associated diseases (obesity, dyslipidemia, depression), unhealthy lifestyles (smoking, alcoholism and physical inactivity), inadequate glycemic control, among others.<sup>20-22</sup>

The risk factor "inadequate glycemic control" in this article will be evaluated by means of 3 consecutive doses of glycated hemoglobin (Hb A1 C > 7.0%), since this test reflects blood glucose levels in the last 120 days long-term glycemic control). It is widely established that good metabolic control is essential in the prevention of macrovascular and microvascular complications of DM, which in diabetic foot genesis are represented respectively by peripheral obstructive arterial disease and diabetic neuropathy.<sup>3</sup>

In the anamnesis directed at LLs, symptoms of distal sensory neuropathy and vascular insufficiency implicated in the development of the "diabetic foot" will be investigated. Symptoms related to distal symmetrical polyneuropathy, considered to be positive sensory symptoms are: paresthesias (stinging, needles), burning of the feet, pain in legs or feet that worsen at night, sensory changes in "boot" feet or socks, lower members. Neurological symptoms can also be negative, and will be searched for, such as numbness in the legs or feet, as well as feeling of "dead" feet, evidencing a loss of sensitivity. As for the symptoms that show the existence of a vascular insufficiency due to PAOD are pain at rest in the legs or feet, sensation of cold feet, tiredness (weakness) in the legs, intermittent claudication and the presence or history of ulcer (open wound) or amputation on the feet.<sup>6,23-25</sup>

Intermittent claudication is the symptom most commonly associated with PAOD where atherosclerotic occlusion of the LLs occurs, causing, due to the resulting ischemia, a picture of reproducible pain in the calves, thighs or buttocks, which is typically triggered by the act of walking, with relief by rest.<sup>23</sup>

In phase 2, the risk factors for foot ulceration that directly influence diabetic neuropathy such as obesity, identified by body mass index (BMI) and systemic arterial hypertension will be investigated in the general physical examination. It is reported that the risk of developing diabetic neuropathy is directly proportional to BMI.<sup>21</sup>

In the physical examination of the skin and fanners, by means of the inspection technique, the integrity of the skin should be evaluated and signs of neuropathy such as calluses, dryness, cracks and fissures should be examined. Other signs, when present, indicate the presence of vascular insufficiency: absence of hair growth, dystrophic (atrophied and mycotic) nails, cold skin, paleness to limb elevation, and flushing or

cyanosis (reactive hyperemia) in the limb's pendent position. Areas of erythema should be investigated, as their occurrence may indicate tissue damage and imminent ulceration.<sup>6,23-24</sup>

The presence of callosities and/or blisters, early complications due to limb insensitivity, indicates the need for early intervention with the objective of avoiding foot ulceration and a potential amputation.<sup>26</sup> The evaluation of the toes will be made with attention on the presence of onychomycosis and interdigital mycosis (common in diabetics), since these infections can lead to a loss of cutaneous integrity.<sup>13</sup>

The evaluation of the skin and fanners in the proposed instrument also seeks to identify existing ulcers and to evaluate the presence of previous amputations. History of ulcer and/or previous amputation place the patient in a high risk group for the affected extremity and for the contralateral limb.<sup>6</sup>

The last item of the general clinical examination to be approached is evaluation of the osteoarticular system, which includes the investigation of deformities, changes in joint mobility and Charcot Foot (changes related to diabetic neuropathy). Common deformities such as the claw toe (hyperextension of the metatarsophalangeal joint with interphalangeal flexion) or hammer toe (extension of the distal phalanx) are associated, due to increased plantar pressures, the lesion of this region.<sup>24</sup>

In the evaluation of joint mobility, movements of flexion, inversion and eversion of the ankle should be tested, as well as those of the first metatarsophalangeal joint, which are usually the most involved in diabetic neuropathy and, when altered, are risk factors for the appearance of plantar ulceration in individuals with protective sensitivity.<sup>27</sup>

Examination of the joint system will end by evaluating the presence of Charcot Foot. In this condition, there is an acute and localized inflammatory process that affects the bones, joints and soft tissues of the ankle and foot, leading to bone destruction, subluxation, displacements and deformities, leading to the collapse of the midfoot. In the acute phase (acute Charcot), inflammatory, with the classic phlogistic signs of heat, tumor, flushing and pain, there may be little pain symptomatology due to the marked impairment of sensitivity, whereas in the chronic and more advanced phase (chronic Charcot) will predominate important osteoarticular muscles of the middlefoot, with the appearance of calluses and plantar ulcers.<sup>6,28</sup>

The presence of neuropathic abnormalities characterized by the involvement of fine nerve fibers (types A-delta and C) and thick nerve fibers (type A-beta) will also be evaluated at this stage. The former function as receptors for painful stimuli of thermal, mechanical, or chemical origin, as well as receiving the thermal stimuli that are innocuous. The thick fibers of the A-beta type are responsible for the perception of touch, the deep and vibratory sensitivities and are later affected by diabetes in relation to the fine fibers.<sup>29</sup>

When there is the involvement of fine fibers there are alterations: in the sensitivity to the light touch (superficial)

that in the CES will be investigated by the use of a cotton pad to be applied in the back of the feet; in the pain sensitivity, which will be evaluated by means of a needle (or pin) slightly placed in contact with the back of the feet, and finally in the thermal sensitivity, evaluated by means of cold and warm water, applied in said region. The results will be noted as preserved or altered sensitivity and the location of the change specified, if present.<sup>30</sup>

The inability to feel the needle bite (or pin) applied to the dorsal side of the hallux sufficiently to cause a pressure deformity, proximal to the nail, is defined as the absence of perception in any of the hallux, and is associated with a increased risk of foot ulceration.<sup>24</sup>

Foot ulcers occur as a consequence of loss of plantar protective sensibility and can be defined as the level of sensory loss that allows damage to occur in the skin and is not perceived as such by the affected individual, who often thinks that he has a normal sensitivity level. It is from this sensory loss that the infectious complications originate and the potential damage that can culminate in limb amputation. The primary event for ulceration is neuropathy, not arterial disease.<sup>31</sup>

In the presence of thick fiber involvement, which occurs commonly in diabetic neuropathy, there is loss of plantar protective sensitivity and its early detection through the use of Semmes-Weinstein monofilament and the 128 Hz Tuning Fork Test allows for preventive measures that prevent progression to foot ulceration.<sup>32</sup>

The use of Semmes-Weinstein (SW) monofilaments, according to several prospective studies, demonstrates that in the absence of pressure sensation with 10g monofilament, there is a high prediction for subsequent ulceration.<sup>24</sup> The technique recommended by the International Working Group on Diabetic Foot (IWGDF), adapted by the Brazilian Society of Diabetes, will be adopted, which recommends testing at 4 points instead of 3. In this test, the monofilament will be applied to 4 plantar areas: distal phalanx of the hallux, 1st, 3rd and 5th metatarsals, which gives the test a sensitivity of 90% and specificity of 80%.<sup>3</sup>

The monofilament should be applied perpendicular to the skin surface with sufficient pressure to arcuate it, thus remaining for approximately 2 seconds. There will be 3 questions (for each region) regarding the patient's perception of touch, whom should answer yes or no. 2 applications will be real and 1 will be simulated without the patient being able to see what the examiner is doing. The protective plantar sensitivity will be considered present for each test region if the patient responds correctly 2 of the 3 questions.<sup>10</sup>

There are several prospective studies that confirm monofilament as the ideal instrument for tracking diabetic foot.<sup>3</sup> The test results will be noted in a specific field on the clinical chart as normal or changed for both lower limbs, and marked changes in footprints in the corresponding areas.

The evaluation of the vibration sensitivity through the 128 Hz tuning fork (where there is a field with normal/

altered options for both lower limbs) will be performed. This will be placed in a bony part on the dorsal surface of the distal phalanx of both hallux, perpendicularly and with a constant pressure, without the patient being able see the procedure. The contact of the tuning fork with the area examined will be repeated, but it must be switched with a time when there is only simulation of the tuning fork, and the vibration sensitivity will be preserved if at least 2 of 3 responses are correct. If the test is abnormal, the individual will be considered as "at risk of ulceration".<sup>10</sup> It should be emphasized that a response is considered abnormal when the individual ceases to feel the vibration while the examiner is still able to perceive it.<sup>13</sup>

At the end of the neurological evaluation of this clinical record, the patient's motor function will be investigated. It will be observed the presence or absence of atrophy of the intrinsic muscles of the foot, which may contribute to the increase of the plantar pressures due to the appearance of deformities and decrease of the range of movement of the foot and ankle, with evolution to callosities and pressure ulcers.<sup>27,33</sup>

Changes in gait result from the reduction of various types of ankle and foot movements, compromising the ability to absorb shock and transverse rotations during walking, contributing to the appearance of plantar ulcers in the insensible foot, thus justifying its evaluation in the proposed CES.<sup>27</sup>

The presence of abnormality of the Aquileu reflex has been associated with an increased risk of foot ulceration in univariate and multivariate analyzes,<sup>34</sup> and will be searched by means of a reflex hammer, which will be applied after the ankle is placed in a neutral position.<sup>24</sup> After evaluation of the peripheral nervous system, the peripheral arterial system will be appreciated. It is widely recognized that PAOD is a risk factor for lower limb amputation in diabetics.<sup>35</sup>

Often, the picture resulting from this obstruction is more subtle in diabetics when compared to non-diabetic individuals, which can be explained by the concomitant neuropathic involvement, which causes many individuals to be asymptomatic, with about one third developing intermittent claudication. Even in asymptomatic individuals, the presence of arteriopathy is a marker for systemic vascular disease (systemic atherosclerosis), with involvement of the cerebral, coronary and renal arteries, which shows the high risk level for acute events such as acute myocardial infarction, stroke and death, emphasizing that the major cause of death and disability, mainly in type 2 diabetics, is atherosclerosis.<sup>3,33</sup>

Thus, the palpation of the posterior tibial and pedicular pulses is mandatory in the diabetic individual. The peripheral arterial obstruction due to atherosclerosis causes a distal reduction of blood flow and perfusion pressure. Vascular involvement is diffuse and especially severe in the tibial and patellofemoral arteries, and the prevalence of long occlusions is high.<sup>36</sup>

In addition to palpation of the wrists, which may sometimes diverge between observers leaving doubts, it is

recommended to measure the ankle-brachial index (ABI) with a manual Doppler 8-10MHz transducer. Taking into account that 50% of diabetic patients have PAOD, and that ABI can be easily calculated, besides being an objective and reproducible method for the screening of arterial disease, its cost is very small when compared to the benefits it provides in the diabetic foot with ischemia associated or not with neuropathy.<sup>3</sup>

ABI, a noninvasive measure for the detection of peripheral obstructive arterial disease and its severity, is obtained with the use of portable vascular Doppler and a sphygmomanometer. The systolic pressure of the distal arteries of both lower limbs (posterior tibial and dorsal pedal) is affected and the largest value obtained by the highest value observed in the measurement of the brachial artery systolic pressure is divided. This index will be calculated for each lower limb, emphasizing that the denominator is common to both lower limbs (greater systolic pressure obtained in the brachial arteries) and the numerator will be specific for each limb.<sup>3,23-24,36</sup> It will be considered without PAOD the  $ABI > 0.90$ , with values  $\leq 0.90$  suggesting arterial obstruction.<sup>23,36</sup>

After performing the osteoarticular evaluations, plantar protective sensitivity by 10g monofilament and vascular assessment for the presence/absence of peripheral obstructive arterial disease, diabetic foot risk classification will be performed, where treatments/recommendations will be proposed, as well as follow-up time and the need for follow-up with generalist and/or specialist.<sup>3</sup>

Phase 3 of this CES refers to the evaluation of self-care with the feet, identifying the level of knowledge of the diabetic patient regarding prophylactic measures and the degree of adherence to self-care. It is well known that patients with DM present failures in the prevention of diabetic foot and its complications, with unfavorable repercussions on quality of life.<sup>16,37</sup>

The prevention of foot injuries (ulcers and amputations) of the person with diabetes requires an interaction with the team responsible for their care, which is able to sensitize the patient and promote a behavior change that favors their performance as a co-participant in preventive measures, where the health professional should evaluate the knowledge acquired and the skills necessary for self-care.<sup>16,38</sup>

In this phase of the FAC, if the non-adherence to the self-care procedures is evidenced, the health professional should guide the diabetic, sensitizing him/her to the strategies of prevention of foot injuries and, at each subsequent consultation, reassess them as to preventive measures.

Phase 4 is intended to instruct and educate DM patients to practice self-care with their feet. Such an educational process allows to increase the motivations and abilities of the patients in the recognition of the actual and potential risks and to provide them with the guidelines of the measures they should take in such situations, emphasizing that the complications related to diabetic foot represent about 40 to 70% of all lower extremity amputations.<sup>10,39</sup>

A prospective study that followed a group of diabetics for 24 months with the intervention of a podiatrist and a diabetes educator showed a significant reduction in the occurrence of such complications.<sup>18</sup> Another study, which lasted six years, showed an effective reduction of ulcers, with a cumulative percentage of 3.1% in the group that underwent the educational intervention against 31.6% in the control group.<sup>18</sup>

Recently, in a study in Denmark, amputation rates among diabetics were reduced by 10% considering low amputations (below the ankle) and 15% for averages (from ankle to knee) when self-care was performed and stimulated.<sup>40</sup>

The existence of a channel of direct and immediate communication between the health team and the patient allows the reporting of recent changes in the feet, which will allow us to direct it to a timely diagnosis and an effective treatment, through intervention in factors of modifiable risk.<sup>17</sup>

## CONCLUSION

This article aimed at the elaboration of a clinical form for prevention of diabetic foot. The proposed CES makes it possible to detect the foot at risk of ulceration early, to assess the degree of self-care with the feet and to guide patients and their families with regard to foot care, and the instruments used to assess the foot at risk of low cost and simple application by health professionals. Comparing the costs generated by the complications that are proposed to avoid, the CES presents a low cost and ease of execution by multidisciplinary team members who have undergone previous training.



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**Figure 1**

<b>Clinical evaluation of lower limbs form for prevention of diabetic foot</b>	
<b>Phase 1 - Anamnesis</b>	
Identification	
Date: ___/___/___	
Name: _____ Registration: _____	
Address: _____	
Telephone: _____	
Date of birth: ___/___/___	
Sex: _____	
Race: a) white ( )      b) brown ( )      c) black ( )      d) other ( )	
Marital status: _____ Occupation: _____	
Scholarity: ___ (years of study)      Family income: _____ (in minimum wages)	
History of diseases (personal and family)	
Type of diabetes:	
Type 1 ( )      Type 2 ( )      Other ( )      Age at diagnosis: _____ years old	
Duration of diabetes (in years): _____	
Type of DM treatment: Insulin (___) Yes (___) No	
Oral drugs: ( ) Yes ( ) No Other: _____	
Other associated diseases: ( ) Yes ( ) No Which: _____	
Family history:	
Risk Factors for Foot Ulcers	
Inadequate glycemic control (Hb A1c >7,0% in 3 exams)	( ) Yes ( ) No
Duration of diabetes (≥10 years)	( ) Yes ( ) No
Elderly (>60 years old)	( ) Yes ( ) No
Dyslipidemia (hypercholesterolemia, hypertriglyceridemia and low HDL)	( ) Yes ( ) No
Arterial hypertension	( ) Yes ( ) No
Retinopathy (researched with fundoscopy)	( ) Yes ( ) No
Nephropathy (albuminuria research)	( ) Yes ( ) No
Obesity (BMI≥30 kg / m <sup>2</sup> )	( ) Yes ( ) No
Sedentary lifestyle	( ) Yes ( ) No
Smoking	( ) Yes ( ) No
Alcohol consumption	( ) Yes ( ) No
High stature	( ) Yes ( ) No
Low visual acuity	( ) Yes ( ) No
Psychosocial factors (denial of illness, low social status, living alone)	( ) Yes ( ) No
Inadequate shoes and / or walking barefoot	( ) Yes ( ) No
1.4 Anamnesis directed to the lower limbs (legs and feet)	
PNSD Positive Sensitive Symptoms	Member affected
Burning sensation in the feet?	R ( ) L ( )
( ) Yes ( ) No	
Stinging/pricking sensation in legs or feet?	R ( ) L ( )
( ) Yes ( ) No	
Pain in legs or feet that get worse at night?	R ( ) L ( )
( ) Yes ( ) No	
Feel sensitive changes on the feet wearing boots or socks?	R ( ) L ( )
( ) Yes ( ) No	
Lancinating pain in the lower limbs?	R ( ) L ( )
( ) Yes ( ) No	

*(To be continued)*

(Continuation)

Time related to the onset of positive sensory symptoms:

less than 30 days       30 - 60 days       over 60 days

PNSD Negative Sensitive Symptoms

Member affected

Numbness in legs or feet?

R ( ) L ( )

Yes     No

Feel leg / foot as if it were "dead"?

R ( ) L ( )

Yes     No

PAOD Vascular symptoms

Member affected

Tiredness (weakness) in the legs?

R ( ) L ( )

Yes     No

Feel cold feet?

R ( ) L ( )

Yes     No

Resting pain in the legs or feet?

R ( ) L ( )

Yes     No

Pain when walking small, medium or large distances that improves with rest (intermittent claudication)?

R ( ) L ( )

Yes     No

Ever had an ulcer (open wound) or an amputation in your feet?

R ( ) L ( )

Yes     No

**Phase 2 - Clinical examination and risk classification of diabetic foot**

2.1 Anthropometric and blood pressure data

Weight: \_\_\_\_\_ Kg

Height: \_\_\_\_\_ m2

BMI \_\_\_\_\_ Kg/m2

Blood pressure (mmHg): Right arm: \_\_\_\_\_ Left arm: \_\_\_\_\_

2.2 Clinical examination of the lower limbs

2.2.1 Clinical examination of skin and faneros (legs and feet)

Signs of Peripheral Autonomic Neuropathy

Dry and scaly skin

R ( ) L ( )

Yes     No

Reddened skin (hyperemia)

R ( ) L ( )

Yes  No

Loss of nails

R ( ) L ( )

Yes  No

Callosities

R ( ) L ( )

Yes  No

Feet clefts

R ( ) L ( )

Yes  No

Abnormality in sweating of feet

R ( ) L ( )

Yes  No

Edema

R ( ) L ( )

Yes  No

Hot foot

R ( ) L ( )

Yes  No

Vascular Ectasias

R ( ) L ( )

Yes  No

Signs of DAOP

Cold skin

R ( ) L ( )

Yes  No

Thin and shiny skin

R ( ) L ( )

Yes  No

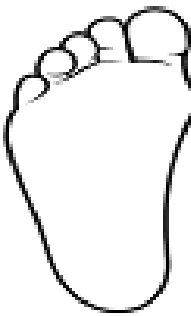

(To be continued)



(Continuation)

Thinning of hair ( ) Yes ( ) No	R ( ) L ( )
Dystrophic fingernails ( ) Yes ( ) No	R ( ) L ( )
Skin pallor ( ) Yes ( ) No	R ( ) L ( )
Color of the limb when lifting it: pallor ( ) Yes ( ) No	R ( ) L ( )
Pendent limb color: flushing or cyanosis ( ) Yes ( ) No	R ( ) L ( )
Ulcers ( ) Yes ( ) No	R ( ) L ( )
Amputations ( ) Yes ( ) No	R ( ) L ( )
Signs suggestive of infection/inflammation/trauma	
Erythema ( ) Yes ( ) No	R ( ) L ( )
Inflammation of the nail fold (Paronychia) ( ) Yes ( ) No	R ( ) L ( )
Blisters ( ) Yes ( ) No	R ( ) L ( )
Interdigital mycosis ( ) Yes ( ) No	R ( ) L ( )
Onychomycosis ( ) Yes ( ) No	R ( ) L ( )
2.2.2 Clinical examination of the osteoarticular system	
Signs of diabetic neuropathy	
Foot deformities:	
Claw, hammer, fingers etc. ( ) Yes ( ) No	R ( ) L ( )
Which: _____	
Abnormal shape of the foot (foot cavus, flat, foot in drop, etc.) ( ) Yes ( ) No	R ( ) L ( )
Which: _____	
Charcot foot ( ) Yes ( ) No	R ( ) L ( )
Altered foot joint mobility ( ) Yes ( ) No	R ( ) L ( )

2.2.3 Record of abnormalities in the clinical examination of the feet

Right	Left	Indicate by placing the corresponding letters where there is:
		C = Calluses D = Deformities F = Fissures or cracks U = Ulceration

Neurological evaluation

2.2.4.1 Surface Sensitivity Examination

(To be continued)

(Continuation)

Thermal (application of cold/heated water):

R Foot: ( ) normal ( ) reduced ( ) absent ( ) increased

L Foot: ( ) normal ( ) reduced ( ) absent ( ) increased

Painful (needle stick/toothpick on the dorsum of the foot):

R Foot: ( ) normal ( ) reduced ( ) absent ( ) increased

L Foot: ( ) normal ( ) reduced ( ) absent ( ) increased

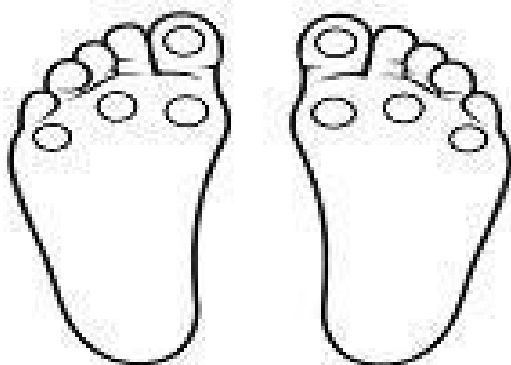
Tactile (cotton on the dorsum of the foot):

R Foot: ( ) normal ( ) reduced ( ) absent ( ) increased

L Foot: ( ) normal ( ) reduced ( ) absent ( ) increased

2.2.4. 2 Semmes-Weinstein Monofilament Pressure Perception Evaluation

Right Left Indicate the level of sensation in the circles:



+ = Can feel the 10g nylon filament

- = Can not feel the 10g nylon filament

Right foot: normal ( ) changed ( )

Left foot: normal ( ) changed ( )

NOTE: If there is no sensitivity, the foot is at risk of ulceration.

2.2.4.3 Evaluation of Vibratory sensitivity (with Tuning Fork of 128 Hz)

Distal phalanx of the right hallux: ( ) normal ( ) reduced ( ) abolished

Distal phalanx of the left hallux: ( ) normal ( ) reduced ( ) abolished

2.2.4.4 Motor Rating

Gear shift

Type: \_\_\_\_\_

R ( ) L ( )

( ) Yes ( ) No

Atrophy of the leg

R ( ) L ( )

( ) Yes ( ) No

Atrophies of interosseous muscles of the metatarsus

R ( ) L ( )

( ) Yes ( ) No

Muscular weakness

R ( ) L ( )

( ) Yes ( ) No

Aquileu Reflection:

R Foot: ( ) normal ( ) reduced ( ) absent ( ) increased

L Foot: ( ) normal ( ) reduced ( ) absent ( ) increased

2.2.5 Evaluation of the vascular system

2.2.5.1. Peripheral pulses

Palpable posterior tibial pulse ( ) Yes R ( ) L ( )

( ) No R ( ) L ( )

Palpable pedal pulse ( ) Yes R ( ) L ( )

( ) No R ( ) L ( )

2.2.5.2 Diagnostic criteria for PAOD based on the Ankle-Brachial Index (ABI)

ABI: Without PAOD : > 0,9 ( ) PAOD: ≤ 0,9 ( )

2.3 Diabetic foot risk classification

Risk	Definition	Treatment/ Recommendations	Follow-up
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(To be continued)

(Continuation)

0	No PSP* No PAOD** No deformities	Education/Proper footwear	Yearly (Generalist or specialist)
1	PSP+Deformities	Proper footwear prescription Surgery if indicated (prophylactic)	Every 3-6 months
2	PSP+PAOD	Proper footwear prescription Consultation with vascular	Every 2-3 months (specialist)
3	Ulcer, prior amputation	Like in 1 Follow-up with vascular	Every 1-2 months (specialist)

\*PSP: Loss of Protective Planting Sensitivity;

\*\* POAD: Peripheral Obstructive Artery Disease

Retrieved from SBD- Guidelines 2013-2014 Reference 3

**Phase 3 - Assessment of self-care**

1- Examines feet daily for blisters, calluses, wounds, redness, or any other change, including on the soles of the feet or between the toes?

Yes  No

2- Washes feet every day with warm water and soap and then dries feet and between fingers with a soft, dry towel, without rubbing the skin?

Yes  No

3- Removes cuticles with pliers, cut ingrown nails or calluses?

Yes  No

4- Cuts nails straight with scissors with rounded tips?

Yes  No

5- Uses moisturizer on feet daily, but never between the toes?

Yes  No

6- Wears clean, comfortable socks, made of wool or cotton and seamless?

Yes  No

7- Walks barefoot or wearing slippers with straps between your toes?

Yes  No

8- Wears shoes that are tight or uncomfortable for your feet?

Yes  No

9- Examine the shoes and shake them before using them?

Yes  No

10- Pays attention to the places you walk to avoid foot injuries?

Yes  No

**Phase 4 - Foot Care Guidelines**

1. Examine your feet daily for blisters, calluses, wounds, redness, or any other change, including on the soles of the feet or between the toes. If necessary use a mirror or ask for help from a relative or other person.

2. Wash your feet every day with warm soapy water and neutral soap. Avoid hot water. Do not leave your feet immersed. Dry your feet well with a soft, dry towel, thoroughly wiping the skin between your fingers, especially between the last toes.

3. Hydrate your feet: a moisturizing cream, but not between the toes or in areas where there are open wounds or cracks. Do not use talc, as it causes dryness and thus predisposes the appearance of lesions.

4. Wear clean socks: change them daily. They should be comfortable, no seams, and preferably cotton, lighter color or white, as it facilitates the identification of possible injuries. Do not wear shoes without socks.

5. Shoes: only shoes that do not tighten and completely cover the toes and heel, made of soft leather or canvas and without internal seams. Square-foot shoes are recommended for a more adequate arrangement of the fingers. Heels of up to 3 cm. In the summer, slippers can be worn that have no strap between the toes, be resilient and soft and its use will start in the morning when you leave the bed.

6. New shoes: should be used gradually. Use them in the first few days only at home for a maximum of two hours.

(To be continued)

(Continuation)

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7. Never walk barefoot: shoes should always be palpated inside and shaken to remove debris before using them to prevent objects inside your foot from injuring your feet.

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8. Nail cutting: Always be straight and not too tight, preferably after bathing (when they are soft), with rounded-tipped scissors. In case of vision problems ask someone else's help to cut the nails.

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9. Calluses: Do not remove corns, nor try to fix ingrown nails. Seek professional treatment.

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10. Call your doctor or health care provider right away if you have calluses, cracks, scaling, blisters, itching, or wounds on the feet (including the soles of the feet and regions between the toes) and also in case of leg pain at walking or cold, numb legs with paleness or bluish coloring.

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References 10, 17, 18, 19, 20

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**Clinical Impression:**

Foot at risk of ulceration  Yes R  L

No R  L

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Professional responsible for filling (signature and stamp)