

Digital educational technology for care management of diabetes mellitus people's feet

Tecnologia educacional digital para a gestão de cuidados dos pés de pessoas com diabetes mellitus
Tecnología educativa digital para el manejo del cuidado de los pies de personas con diabetes mellitus

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ABSTRACT

Objective: to develop and validate a distance learning course aimed at the pillars of care management of diabetes mellitus people's feet. **Method:** a technological production research using Moodle Virtual Learning Environment, based on Andragogy, Constructionism and Instructional Design. Content is based on consensus guidelines on diabetic foot. Validation was carried out by distance education, diabetes and/or diabetic foot experts. **Results:** the course's content is based on diabetic foot guidelines, and is structured in units with didactic material, videos, forums and questionnaires to assess the participants' learning. The judges considered it appropriate to meet nurses' needs in clinical practice. **Conclusion:** the virtual learning course has been validated, being a promising strategy for training nurses on care management of diabetes mellitus people's feet.

Descriptors: Education, Distance; Validation Studies; Diabetes Mellitus; Primary Health Care; Nursing.

RESUMO

Objetivo: desenvolver e validar um curso, na modalidade a distância, voltado para os pilares da gestão dos cuidados com os pés das pessoas com diabetes mellitus. **Método:** pesquisa de produção tecnológica utilizando o Ambiente Virtual de Aprendizagem Moodle, fundamentado na Andragogia, Construcionismo e Modelo de *Design* Instrucional. O conteúdo é baseado nas diretrizes do Consenso sobre o pé diabético. A validação foi realizada por juízes especialistas no campo da educação a distância, diabetes e/ou pé diabético. **Resultados:** o conteúdo do curso é baseado nas diretrizes sobre o pé diabético, sendo estruturado em unidades com material didático, vídeos, fóruns e questionários para avaliar a aprendizagem dos participantes. Os juízes consideraram adequado para atender às necessidades dos enfermeiros na prática clínica. **Conclusão:** o curso virtual de aprendizagem foi validado, sendo uma estratégia promissora para a qualificação de enfermeiros sobre gerenciamento dos cuidados com os pés de pessoas com diabetes.

Descritores: Educação a Distância; Estudos de Validação; Diabetes Mellitus; Atenção Primária à Saúde; Enfermagem.

RESUMEN

Objetivo: desarrollar y validar un curso, en la modalidad a distancia, dirigido a los pilares del manejo del cuidado del pie de personas con diabetes mellitus. **Método:** investigación de producción tecnológica utilizando el Entorno Virtual de Aprendizaje Moodle, basado en Andragogia, Construcionismo y Modelo de Diseño Instrucional. El contenido se basa en las directrices de Consenso sobre el pie diabético. La validación fue realizada por jueces expertos en el campo de la educación a distancia, diabetes y/o pie diabético. **Resultados:** el contenido del curso se basa en las directrices sobre pie diabético, estando estructurado en unidades con material didáctico, videos, foros y cuestionarios para evaluar el aprendizaje de los participantes. Los jueces lo consideraron adecuado para satisfacer las necesidades de las enfermeras en la práctica clínica. **Conclusión:** se ha validado el curso virtual de aprendizaje, siendo una estrategia prometedora para la capacitación de enfermeros en la gestión del cuidado del pie para personas con diabetes

Descriptorios: Educación a Distancia; Estudios de Validación; Diabetes Mellitus; Atención Primaria de Salud; Enfermería.

INTRODUCTION

Diabetes mellitus (DM) affects about 415 million people worldwide. Estimates show that this number is expected to exceed 640 million people by 2040⁽¹⁾. Of these, 25% develop foot ulcers and 70% of all lower limb amputations are in people with DM, and 85% of surgical procedures are preceded by a foot ulcer⁽¹⁻²⁾. In this context, in recent years there has been a growing interest on the part of researchers and health professionals in the development of interventions for diabetic foot (DF) prevention and treatment⁽²⁻⁴⁾.

The global prevalence of ulcers in DM people's feet is 6.3% and some countries have rates below average, such as Oceania (3.0%) and Australia (1.5%). Countries like Belgium (16.6%), Canada (14.8%) and the United States of America present indexes above the world average⁽⁵⁾.

Research on the prevalence of DM ulcers with methodological rigor is scarce in the Brazilian context. In Brazil, it is estimated that the prevalence of foot ulcers reaches 4 to 10% of people with DM⁽⁶⁻⁷⁾.

A multicenter study⁽⁸⁾ developed with 1,455 people with diabetes in 19 Brazilian centers identified a population with DF (18%) and amputation (14%), especially in more developed regions, which may be associated with the presence of comorbidities. However, an even higher and increasing prevalence is possible in developing countries and in underdeveloped countries⁽⁹⁾. Precarious living conditions, difficulties in accessing health services and minimizing the integrality of promotion, prevention and treatment actions in primary care are considered to be important social aspects that influence the appearance of chronic complications.

In Brazil, as observed in the world population, the main risk factors for developing DF ulcerations and amputations are the presence of comorbidities. Such factors are peripheral vascular disease (PVD) and diabetic neuropathy, which causes gradual loss of tactile and painful sensitivity and makes the feet vulnerable to trauma^(1,10), characterized by a reduction or loss of protective sensitivity, strongly present when physical examination of the feet and education for people and caregivers are absent⁽¹¹⁾.

Incorrectly cutting the nails, using inappropriate shoes, presence of interdigital mycoses and calluses, dry skin, as well as cracks and fissures in the feet, and recurrence of ulcerations are also associated with DF development⁽¹²⁾. There are several factors associated with DF development, ranging from inadequate care with daily foot hygiene, to general aspects such as advanced age and education, glycemic non-control and diabetes diagnosis time⁽¹¹⁻¹³⁾.

One of the challenges in treating DF is the fact that the approach usually occurs in advanced stages of complication, in which prognosis is reserved due not only to the progress of DF's severity, but also to the support and care resources that are often scarce⁽²⁾. It is emphasized that in several locations, most people with diabetes do not have their feet examined, or even have their shoes taken off during consultations^(8,12).

The proper approach of DF has a high financial impact on health systems, with costs present from primary care over months or years, to in many cases, demands towards the functional rehabilitation of people with diabetes^(10,14).

The Brazilian scientific literature is still incipient about the financial costs of treating complications in the lower limbs of people with DM. A pioneering study, aiming at estimating the

general economic burden of DF in Brazil, estimated the annual direct medical costs to treat DF in outpatient clinics and hospitals at US\$361 million. This fact indicated that approximately 0.31% of the Unified Health System (SUS - *Sistema Único de Saúde*) resources were destined to people with DM with severe foot complications. Of this total, US\$27.7 million (13%) was spent for hospitalization and US\$333.5 million (87%) for outpatient care; however, although the resources allocated to these treatments are significant, it is believed that the values are underestimated⁽¹⁵⁾.

The direct costs of ulcerated feet include hospital costs, medical consultations, long-term care and home care for treatment and rehabilitation of people's health, seeking to promote quality of life and functional capacity to gradually resume activities of daily living, if feasible. Prolonged hospitalization for surgical procedures, use of medications, even amputations, due to the complexity of ulcerations and systemic impairment are evidenced. It is worth mentioning that the real expenses go beyond the amounts passed on by SUS, making them insufficient for all the demands arising from hospital care⁽¹⁵⁾. Indirect costs include premature morbidity and mortality. The total costs include the sum of rights, offloading devices⁽¹⁶⁾ that contribute to minimize the risk of foot ulcers, plus the addition of indirect costs related to a social perspective that must also be taken care of⁽¹⁵⁾.

A systematic review with meta-analysis found that on average an amputation costs between US\$35,000 and US\$45,000 in developed countries, and substantially less in developing countries at a cost of approximately US\$5,000⁽¹⁴⁾. Considering the high prevalence, complexity, severity and high costs of DF, systematic and educational interventions in prevention and treatment are mandatory⁽²⁻³⁾.

At the same time, it is possible to reduce DF amputations by between 40% and 85% by implementing combined strategies based on interdisciplinary treatment, teamwork, with monitoring and training of health professionals⁽²⁾. Primary health care professionals need continuing education in order to prevent limitations in activities of daily living and emotional, social and functional impairments due to this cause.

Updating health professionals is one of the pillars that support care management of DM people's feet. Among health professionals, nurses have a strategic role in foot care interventions, since they are often the first persons to have contact with people with the condition. Therefore, they must be prepared to carry out a careful evaluation of the feet, one of the recommended practices for nursing consultation with people with diabetes⁽¹⁷⁾.

A strategy for preparing and updating of nurses' duties is distance learning (DL). This teaching-learning modality has favorable characteristics such as flexibility of access to study and carry out proposed activities and possibility of frequent updating, on various topics; rupture in the relationship between space and time; reduction in costs with travel and physical structure; professionals for improvement⁽¹⁸⁾.

DL courses enable continuing education and training for a large number of professionals working in the health field⁽¹⁹⁻²⁰⁾. Technological resources have been used mainly to underpin clinical decision, management and performance monitoring and planning of health units⁽²¹⁾. The successful implementation of information technologies in health services strengthens the work process and the practices and care management and patients

and professional safety⁽²¹⁻²²⁾. Experiences in proposing and using information technologies have been developed in primary care, with computerization gradually being implemented in Brazilian health units. It is also warned about the importance of continuing education actions for BHU employees to improve the incorporation of computer skills, for the effective use of information and communication technologies between health and nursing services, in addition to the fact that educational technological resources are expanded in primary care⁽²²⁻²³⁾.

Due to the impact that complications that DM people may have on foot, the role of nursing staff in primary care in caring for this risk group is essential. In addition to the compromises in these people's health and lives, there is a gap in the scientific literature regarding training courses for primary care nurses using DL that covers all the pillars of care management of DM people's feet. Thus, there is an urgent need to update and qualify nurses on preventive and treatment actions for DF.

OBJECTIVE

To develop and validate a DL course aimed at the pillars of care management of DM people's feet.

METHODS

Ethical aspects

This study was approved by the Research Ethics Committee (REC) of *Universidade Federal de São Paulo* (UNIFESP), with a grant from the Brazilian National Council for Scientific and Technological Development (CNPq - *Conselho Nacional de Desenvolvimento Científico e Tecnológico*).

Design, place of study and period

This is a study of software, courseware and virtual learning environments in DL modality technological production⁽²⁴⁾. Data collection took place between December 2014 and March 2015. The course development includes pedagogical aspects based on andragogy, which permeate adult education, which are: need to know, learner's self-concept, role of experiences, readiness to learn, guidance for learning and motivation⁽²⁵⁾; in Constructivism, educational philosophy of Modular Object Oriented Distance Learning (Moodle), centered on student/professional with a tutor⁽²⁶⁾.

The course and all the material developed is hosted in the Moodle Virtual Learning Environment (VLE) of *Universidade Aberta do Sistema Único de Saúde* (UNA-SUS). After making it public, in order to access it, it will be necessary to register in advance to acquire a login and a password.

To insert the Moodle course's content, the following resources were needed: materials such as a computer with broadband internet access; a VLE; iSpringfree[®] 7.0.0.6695 for teaching material production; human resources, composed by the main researcher, responsible for didactic content creation; a computer technician with experience in the Moodle system; a professional to obtain and edit didactic videos and financial resources.

Population; inclusion and exclusion criteria

Expert judges (EJ) were selected for convenience. They were indicated by two of the researchers in the present study due to their experience in DL and DM/DF. People who act as experts in the field of interest for at least 2 years were included.

The number of EJ was defined following the Pasquali guidelines⁽²⁷⁾, who suggests six to twenty subjects, three subjects in each group of professionals. Fifty-seven EJ were invited, 31 from the DL field and 26 from the DM/DF field. Forty-five EJ (75%) were excluded, 27 (43.3%) for not responding to the invitation and 18 EJ (31.7%) for not respecting the evaluation's delivery deadline (3 months).

The research objectives were clarified, and all participants (EJ) signed the Informed Consent Form (ICF) online.

Study protocol

The methodological path to build the course followed a model known as Analysis, Design, Development, Implementation and Evaluation (ADDIE), following the Instructional Design, consisting of five interdependent stages⁽²⁸⁾.

1) Analysis: composed of learning needs, theme delimitation, target audience and educational objectives. The theme and activities were planned and developed based on the "Consensus on the Diabetic Foot and Step by Step"⁽²⁾.

2) Design: from the theoretical support related to foot complication prevention, the pedagogical project was created. The content was mapped, structured, and sequenced. To follow the specific objectives of each unit⁽²⁹⁾, activities were traced using Moodle resources, news forum, notice board, virtual cafe, glossary activity, in addition to standardizing the structure of each unit.

3) Development: took place from June to December 2014, with didactic material production and adaptation of resources in digital environments. The learning situations were constructed with texts, images, videos with demonstration of a physical examination of the feet aimed at dermatological, circulatory, neuropathic, structural and footwear evaluation.

4) Implementation: effective application of the DI proposal, publication and performance;

5) Evaluation: monitoring, reviewing and maintaining the proposed course.

We chose not to implement the course for the target user before it was validated by DL and DM/DF EJ.

Analysis of results

The data collection instrument used in the study was adapted, clarified and authorized for use, previously, by Caetano (2012)⁽³⁰⁾. For evaluation and standardization, each expert judge filled out the online structured instrument in the course's VLE. The instrument developed by Caetano has references for Instructional Design construction and evaluation. It has contextualization for VLE and educational software evaluation criteria, added to particular characteristics due to the objective of providing a broader evaluation. The first part of the instrument comprises identification data with name, training, title and current main activity. The second part covers five aspects of VLE: pedagogical aspects (content, activities

and interaction) and technical aspects (response time and interface quality), with a total of 22 questions. For each of the aspects, an appraiser assigns a value (+1) for fully met characteristic, (0) for partially met characteristic and (-1) for unmet characteristic. For values (0) and (-1), EJ should still include comment and/or justification.

RESULTS

The DL course entitled "*Pilares da gestão de cuidados com os pés de pessoas com diabetes*" (freely translated as pillars of care management of diabetes people's feet) was attended by 12 (21.0%) of the 57 guests. Among participants, seven (58.33%) were female. Of the 12 EJ, five (41.67%) were experts in DL; six (50%) were experts in diabetes and/or DF; one (8.33%) was an expert in both fields of interest.

The contents were didactically structured in environment and embracement. Eight thematic units were used, involving since the diagnosis of diabetes, the physiology of associated comorbidities, the professional practice of nurses, from nursing consultation, circulatory and neuropathic, plantar and footwear evaluation, risk stratification and education of patients, families and professionals in the field. Approaching contents were distributed in seven days, totaling an average of eight weeks to the end of the course, with a workload of 56 hours.

From the specific objectives of each unit, activities in Moodle were standardized so that each unit maintained the same structure: a) didactic material with the themes' theoretical foundation; b) videos with dermatological, neurological and circulatory physical examination of the lower limbs; c) asynchronous thematic forum (s) for debates favoring collective construction of knowledge and integration of students with each other and with tutors; d) activity consisting of a multiple choice online questionnaire related to the week's theme; e) weekly supplementary material with extra texts, videos, and scientific articles; f) forum for questions posted about content and activities.

The course's content was the first pedagogical aspect assessed by EJ. Relevance, clarity, applicability, quantity and consistency make up the categories assessed (Figure 1).

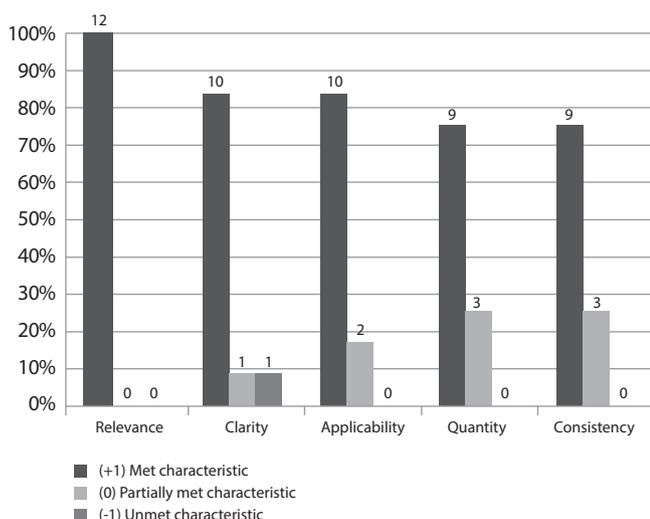


Figure 1 – Pedagogical aspects: conteúdo, Itajubá, Minas Gerais, Brazil, 2015 (N=12)

After assessing the proposed activities in each unit, the categories were assessed as relevant, with clarity, and with applicability, quantity and educational evaluation (Figure 2).

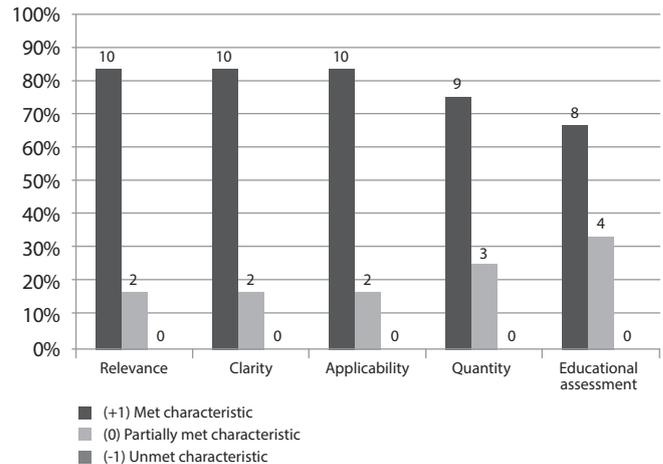


Figure 2 - Pedagogical aspects: atividades, Itajubá, Minas Gerais, Brazil, 2015 (N=12)

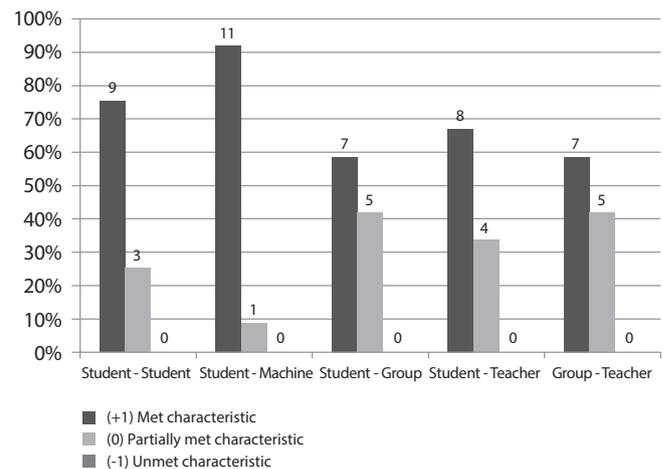


Figure 3 - Pedagogical aspects: interação, Itajubá, Minas Gerais, Brazil, 2015 (N=12)

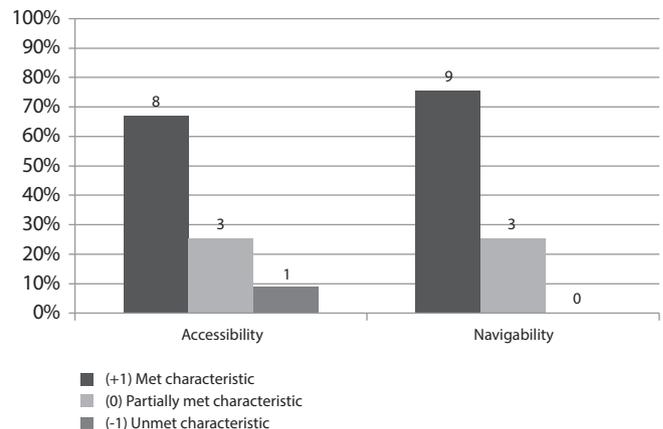


Figure 4 - Technical aspects: response time, Itajubá, Minas Gerais, Brazil, 2015 (N=12)

In the environmental aspect to promote interaction, student-student, student-teacher, student-group, and group-teacher interactions were considered. Most of these categories were met

or partially met by EJ because interactions were measured and assessed after the course was applied to primary care nurses (target audience) (Figure 3).

The course's technical aspects in relation to response time were assessed. The accessibility categories related to the ease of entry on the environment pages and navigability related to the functioning of buttons, links and user guidance were assessed as being met by most EJ (Figure 4).

The categories' interface quality (colors, screen space, letters, figures, and sound) was assessed as met by most EJ, and only the category related to the sound was partially met, claiming that the sound quality in some videos could be improved (Figure 5).

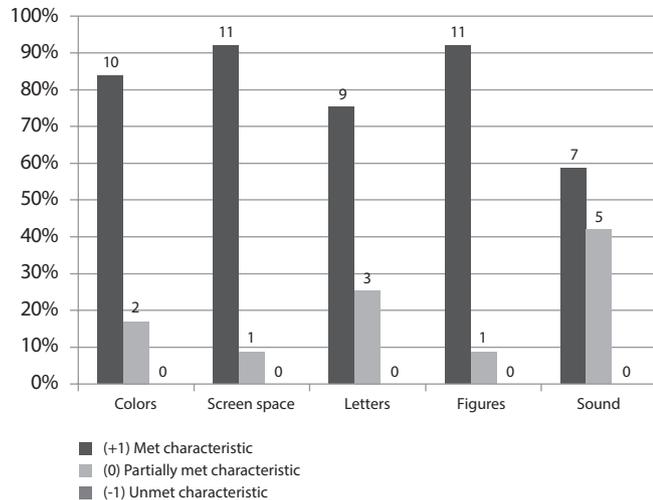


Figure 5 - Technical aspects: interface quality, Itajubá, Minas Gerais, Brazil, 2015 (N=12)

DISCUSSION

Adopting pillars of care management of DM people's foot in nurses' work in primary care aims to prevent skin ulcers from appearing and prevent amputations and their impacts^(2,12).

This course was developed and validated based on the best scientific evidence in DM for screening feet at risk, endorsed by professionals' contributions with technical and scientific expertise in the fields⁽²⁾. The course's objectives were achieved, indicating approximately the totality of agreement among appraisers, pointing to relevance, comprehensible approach, depth of the themes to contribute to knowledge building and updating. The experience of different learning situations that were planned and organized by an interdisciplinary staff intended to subsidize and qualify the clinical practice of nurses in Basic Health Units (BHU).

The necessary corrections were made by the researchers; later, they were reassessed with approval of all EJ.

Studies of construction and validation of interventions and DL continuing education focus more in the context of hospital care⁽³¹⁻³³⁾, indicating gaps in education aimed at primary care⁽³¹⁾. These, as well as the present, are structured in modules/thematic learning units, spaces for discussion, cases and didactic resources⁽²⁷⁾.

A research study on the teaching-learning process of primary care workers, through dl mediated by technologies, showed the importance of recognizing consolidating continuing education in health to reorganize and strength socially and technically qualified

practices with applicability and co-management of managers, municipal, state and federal representatives⁽³⁴⁾.

Concerning course's content, important information retrieval about diabetes classification, epidemiology, risk factors, ulceration mechanisms allowed recognizing changes and modifications, identifying signs and interpreting symptoms to develop plans and strategies for preventing and treating complications that occur from diabetes^(2,9,35). The central objective is to update participants on the best quality evidence on the importance of acting in foot prevention and care and how to carry them out in order to promote patient safety.

DM people need to make adjustments in their lifestyles that permeate behavioral changes. The education of a person, family and health professionals is an essential aspect, considered one of the important pillars of foot care management and fundamental role of nurses as educators⁽³⁶⁻³⁷⁾.

Nursing consultation provides a protective factor against lower limb complications and diabetes mortality. Thus, nurses need to develop and improve attitudes and skills permeated with embracement and empathic communication, promoting the building of trust, bonding between person, family and professional, with qualified listening, and attention from the perspective of comprehensive care⁽³⁶⁾. Technical skills in foot care management such as regular inspection and examination of the foot at risk, risk tracking, education, orthetization, treatment of pre-ulcerative lesion, allow to act early and avoid complications^(8,12,36-37).

Dermatological, neurological, vascular plantar pressure evaluation until even appropriate footwear evaluation is of paramount importance⁽³²⁾. To this end, interactive videos with demonstration of the techniques elucidated nurses how to proceed during nursing consultation⁽³⁵⁾. Feet examination included tests that assessed the risk of development and the presence of peripheral neuropathy. This examination uses Semmes-Weinstein test and Peripheral Arterial Disease evaluation using the ankle-arm doppler index, which is an effective measure for tracking the risk of ulceration^(1,12).

The materials and methods used in distance learning may vary. Knowledge is not simply transferred from an educator to a student, but is learned through the creation of associations between existing knowledge and new information, giving it individual meaning⁽¹⁸⁾.

Most of judges' suggestions were accepted aiming at adapting the Moodle course, such as text proofreading, adding content for a better understanding of specific themes and terminologies on the pillars of foot care management, as clarity of digital texts is an important aspect for meaningful learning⁽³³⁾.

The lack of feedback for evaluation was pointed out by 16.66% of EJ. The suggestion was configured and considered so that after two attempts the student could only access evaluation, reviewing its score, comments and corrections for possible mistakes.

An EJ suggested including a pre-test at the beginning of the setting and participant embracement, and was considered by the authors as an excellent contribution^(26,35-36). Assessing DL learning aims to be practical and pedagogical, occurring before the beginning of the course, during the offer and after the course's offer. From this evaluation, it is possible to identify whether the teaching-learning process is contributing positively with regard to teachers/tutors' and students/participants' actions towards a formative and summative diagnosis⁽³⁷⁾.

Considering the possibility of offering courses at scale, with the evaluation activities provided for in the course, both in formative and summative dimensions, and with the records provided by the VLE of all the processes and activities carried out by students/ participants and by teachers/tutors, it will be possible identify not only gaps in knowledge, but also difficulties of professionals in practice, successful experiences among other aspects related to the theme. Based on the records and analysis carried out by experts, it will certainly be possible to advance research and produce relevant knowledge. Thus, they can be disseminated to a large number of professionals in the national territory in order to transform the scenario and the quality of care to users linked to primary care⁽³⁷⁾.

Some suggestions, such as simplifying content, exchanging photos or figures, have not been modified to maintain the original text's fidelity and for believing that with publication of the course for participants and interactivity and activities, it will be possible to meet the possible needs.

Technical aspects such as response time, interface quality are essential and have been assessed as met in this study as well as in others⁽³³⁾.

Evaluation and validation in relation to the pedagogical and technical aspects of this course was of paramount importance. They brought considerations that offered subsidies for necessary changes and adjustments aimed at improving, course quality and applicability, even before it was published and executed to the target audience.

Constructivism, the theoretical foundation chosen as the guideline to develop this study, promotes presentation and discussion of problem situations experienced by people who are not necessarily active in the health field. Constructivism has a logical and sequential approach to clinical evolution and actions used, favoring the learning and clinical application of professionals and family caregivers, enabling the insertion of guidelines to all people involved in the care process⁽³²⁾.

Interactive and DL transforms the focus from passive and teacher-centered methods into interactive, and student-centered methods and results into more efficient learning. Consequently, the quality of nursing care can be expanded by promoting the search for knowledge and sharing among peers, with increased confidence for more autonomous practices in decision-making^(18,29).

The VLE interaction between student, teacher and group is an important indicator and should be assessed in the future⁽³¹⁾. The wealth that is built from the exchange of experiences, knowledge and different points of view in the training of human resources for health care constitutes a driving encouragement to continue resisting in the safety, care and quality of the health care model.

The scientific literature points out that DL courses are of great interest to health professionals, especially nurses and nursing staff⁽³¹⁾. They have a positive repercussion for inclusion and promotion of improvements in the quality of care practices, when developed based on rigorous planning⁽²⁸⁻²⁹⁾.

In this regard, we believe that DL fills a gap in relation to the presence of training courses for primary care nurses. DL can be effective for continuing education of nurses, as it enhances knowledge building, fosters student autonomy in the search and deepening of content, develops skills, improves the ability

to argue and work together with other participants. With that being said, DL does not intend to replace traditional teaching, but to consolidate itself as a complementary methodology in nurses' teaching-learning process⁽²⁸⁾.

Study limitations

The number of participating EJ among all guests is considered as a possible limitation of this study, since a greater quantity of EJ could bring more contributions aimed at course improvement, quality and applicability to the target audience.

Contributions to nursing, health, and public policies

Considering the alarming number of amputations resulting from DM and the scarcity in the production of studies that developed educational technology involving this theme directed to continuing education professionals working at Primary Health Care in relation to care management of DM people's foot, this course, developed and validated by EJ, fills gaps in nursing training. The course makes it possible to implement continuing DL and adopt preventive actions and early detection of complications that arise in DM people's foot. Thus, ulcerations and amputations can be avoided, which are indicators that interfere with the costs spent in the health field, the social burden and the quality of life of those involved.

In addition to contributing to gaps in DL and health research, since the educational technology developed may reach a greater number of nurses, it will be available on virtual media. It can facilitate access to the course, temporal and spatial flexibility, locomotion, flexible hours, workload hours, reduced costs and appropriation of technology, aiming at strengthening SUS continuing education network and improving nursing research and professional practice.

CONCLUSION

Diabetic foot is one of the main chronic complications resulting from DM. The appearance of podopathy and onychopathy, circulatory, neuropathic, motor and infectious changes lead to ulcerations, responsible for a high number of amputations and mortality in this population. In this context, it is crucial to train nurses through a course on this topic in order to adopt preventive therapeutic measures for early detection and intervention of these complications that may arise in DM people's feet.

To sum up, DL presents a modern, dynamic, viable, effective and strategic alternative to promote interactivity and knowledge of new technologies, with great impact on improving knowledge management and quality of care for people with DM. It is a growing modality today, capable of providing greater access to learning and democratization of knowledge. Additionally, it contributes and encourages the exercise of autonomy and interaction of all subjects involved. It favors producing, exchanging knowledge for scientific dissemination of innovative practices and improving the production of new studies in different contexts of research and nursing practice.

In conclusion, it was possible to develop a digital educational technology for care management of DM people's feet. Such technology has been validated by EJ, and may be made available for

updating, qualification and distance training of Primary Health Care nurses, making it possible to implement intervention measures and preventive actions in the worldwide reduction of complications and tragedies caused by problems in DM people's feet.

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