ORIGINAL ARTICLE

REVISTA ENFERMAGEM ATUAL IN DERME

PREVENTION OF DIABETIC FOOT: CONSTRUCTION AND VALIDATION OF CORDEL AS AN EDUCATIONAL TECHNOLOGY

PREVENCIÓN DEL PIE DIABÉTICO: CONSTRUCCIÓN Y VALIDACIÓN DE CORDEL COMO TECNOLOGÍA EDUCATIVA

PREVENÇÃO DO PÉ DIABÉTICO: CONSTRUÇÃO E VALIDAÇÃO DE CORDEL COMO TECNOLOGIA EDUCATIVA

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ABSTRACT
Introduction: Diabetic foot is a syndrome that involves ulceration of the limbs. **Objective:** To construct and validate a cordel as an educational technology for the prevention and care of diabetic foot. Methods: **Methodological study divided into three stages:** the first refers to a bibliographical research, which aimed to map the evidence and select it to compose the theoretical text of the cordel. The second occurred through the construction of the educational cordel and the third was the validation of the content and appearance of the cordel. To analyze the agreement between expert judges, the content validity index (CVI) was calculated. **Results:** Twenty-three expert judges who were nurses working in the care of people with diabetes, mainly with diabetic foot (91.3%; n=21) and teaching (8.7%; n=2) participated. When evaluating the CVI of the instrument items, it was identified that all were considered validated, as they obtained CVI>0.80 and p>0.05. In the cordel construction stage, the "content" domain presented CVI=0.93 and p=0.281; the "language" domain presented CVI=0.99 and p=0.141; the "graphic illustrations" domain had CVI=0.91 and p=0.480; the "motivation" domain presented CVI=0.97 and p=0.300; and the "cultural adequacy" domain had CVI=0.98 and p=0.064. Two judges suggested adding the importance of continuous multidisciplinary monitoring and two other judges suggested changing the term "doctor" to refer to the physician, aiming to clarify the category of each professional and their functions within the health team. **Conclusion:** It is understood that, in addition to the educational technology of cordel being innovative, it has an easy-to-understand language, thus evidencing its relevance for assisting patients with diabetes, enabling self-care in order to prevent diabetic foot.
Keywords: Diabetes Mellitus; Diabetic Foot; Educational Technology; Validation Study.

RESUMEN
Introducción: El pie diabético es un síndrome que implica ulceración de las extremidades. **Objetivo:** Construir y validar un cordel como tecnología educativa para la prevención y el cuidado del pie diabético. **Métodos:** Estudio metodológico dividido en tres etapas: la primera se refiere a una investigación bibliográfica, que tuvo como objetivo mapear la evidencia y seleccionarla para componer el texto teórico del cordel. La segunda ocurrió a través de la construcción del cordel educativo y la tercera fue la validación del contenido y la apariencia del cordel. Para analizar la concordancia entre jueces expertos, se calculó el índice de validez de contenido (IVC). **Resultados:** Participaron veintitrés jueces expertos que eran enfermeros que trabajan en el cuidado de personas con diabetes, principalmente con pie diabético (91,3%; n=21) y docencia (8,7%; n=2). Al evaluar el IVC de los ítems del instrumento, se identificó que todos se consideraron validados, ya que obtuvieron IVC > 0,80 y p > 0,05. En la etapa de construcción del cordel, el dominio "contenido" presentó un IVC = 0,93 y p = 0,281; el dominio "lenguaje" presentó un IVC = 0,99 y p = 0,141; el dominio "ilustraciones gráficas" tuvo un IVC = 0,91 y p = 0,480; el dominio "motivación" presentó un IVC = 0,97 y p = 0,300; y el dominio "adecuación cultural" tuvo un IVC = 0,98 y p = 0,064. Dos jueces sugirieron añadir la importancia del seguimiento multidisciplinario continuo y otros dos sugirieron cambiar el término "médico" para referirse al médico, con el objetivo de aclarar la categoría de cada profesional y sus funciones dentro del equipo de salud. **Conclusión:** Se entiende que, además de ser innovadora, la tecnología educativa del cordel cuenta con un lenguaje fácil de entender, lo que demuestra su relevancia para la asistencia a pacientes con diabetes, facilitando el autocuidado para prevenir el pie diabético.

Palabras clave: Diabetes Mellitus; Pie Diabético; Tecnología Educativa; Estudio de Validación.

RESUMO
Introdução: O pé diabético é uma síndrome que envolve ulceração de membros. **Objetivo:** Construir e validar um cordel como tecnologia educativa para prevenção e cuidado do pé diabético. **Métodos:** Estudo metodológico dividido em três etapas: a primeira refere-se a uma pesquisa bibliográfica, que teve o intuito de mapear as evidências e selecioná-las para compor o texto teórico do cordel. A segunda ocorreu mediante a construção do cordel educativo e a terceira foi a validação do conteúdo e aparência do cordel. Para análise da concordância entre juízes especialistas, calculou-se o índice de validade de conteúdo (IVC). **Resultados:** Participaram 23 juízes especialistas enfermeiros com atuação na assistência a pessoas portadoras de diabetes, principalmente com pé diabético (91,3%; n=21) e docência (8,7%; n=2). Ao avaliar o IVC dos itens do instrumento, identificou-se que todos foram considerados validados, pois obtiveram IVC>0,80 e p>0,05. Na etapa de construção do cordel, o domínio "conteúdo" apresentou IVC=0,93 e p=0,281; o domínio "linguagem" apresentou IVC=0,99 e p=0,141; o domínio "ilustrações gráficas" teve IVC=0,91 e p=0,480; o domínio "motivação" apresentou IVC=0,97 e p=0,300; e o domínio "adequação cultural" teve IVC=0,98 e p=0,064. Dois juízes sugeriram acrescentar a importância do acompanhamento contínuo multiprofissional e outros dois juízes sugeriram a troca do termo "doutor" para se reportar ao médico, visando, com isso, esclarecer a categoria de cada profissional e suas funções dentro da equipe de saúde. **Conclusão:** Entende-se que, além da tecnologia educativa de cordel ser inovadora, dispõe de uma linguagem de fácil compreensão, evidenciando, assim, sua relevância para assistência aos pacientes com diabetes, viabilizando o autocuidado no sentido de prevenir o pé diabético.
Palavras-chaves: Diabetes Mellitus; Pé Diabético; Tecnologia Educacional; Estudo de Validação.

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INTRODUCITION

Chronic noncommunicable diseases (NCDs) include circulatory system diseases, cancer, diabetes mellitus (DM), and chronic respiratory diseases, which account for the highest morbidity and mortality rates worldwide, accounting for 63% of all deaths. They cause a loss of quality of life, restrictions, and disability(1). In the epidemiological scenario of chronic diseases, DM has a high rate of comorbidities and, over time, can lead to complications that involve high effective costs for patients and for public health, becoming a serious problem[2].

The World Health Organization (WHO) considers this condition a severe metabolic syndrome of multiple etiologies and can be determined by the absence and/or deficiency of insulin to adequately exert its effects, evidencing hyperglycemia in the individual. The most prevalent chronic complications of DM include: diabetic retinopathy (its prevalence increases with the duration of type 1 and type 2 diabetes mellitus), cardiovascular disease (DM is associated with between half and one-third of all cardiovascular deaths and doubles the risk of cardiovascular disease), chronic kidney disease, and diabetic neuropathy[3].

Diabetic foot ulcers are a syndrome involving limb ulceration. They are one of the main complications of DM and are associated with high levels of morbidity and mortality, resulting in significant financial costs for treatment. The lifetime incidence of foot ulcers in patients with diabetes is 19% to 34%, with an annual rate of 2%[4].

Approximately 537 million adults live with diabetes. The total number of people with this disease is projected to increase to 643 million by 2030. Three in four adults with diabetes live in low- and middle-income countries, a fact that has already caused 6.7 million deaths. Diabetes has already accounted for US$966 billion in healthcare spending – 9% of total adult spending. Regarding children and adolescents, more than 1.2 million live with type 1 diabetes. It is also observed that one in six live births (21 million) are affected by diabetes during pregnancy, and 541 million adults are at increased risk of developing type 2 diabetes[5].

Currently, there is a broad discussion about technologies related to the healthcare sector. Among the practices performed by nurses, the use of technologies in product and process design is common. In this sense, technology is analyzed both as knowledge and for its material and non-material implications in the production of healthcare services.

Cordel literature is a highly relevant cultural expression of the Northeastern population. It is present in social spaces, addressing a variety of topics and acting as a vehicle for information and reflection on specific topics. It also provides positive implications for the population's health conditions[6].

This tool could become essential for guiding nurses during nursing consultations and in approaching people with diabetes, providing greater confidence to both professionals and

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users, in addition to supporting empowerment as a form of autonomy for health promotion.

Given this context, the question arises: is it possible to develop and validate a cordel as an educational technology for diabetic foot prevention and care, valid in both content and appearance? It is expected that the development of the tool will bring together a set of empirical, scientific, and systematized knowledge. Once produced, it can be used by nursing professionals and foster innovation in the work process to achieve health promotion[7].

The present study aims to develop and validate a cordel as an educational technology for diabetic foot prevention and care.

METHODS

Ethical aspects

This study was developed in accordance with Resolution No. 466/2012 of the National Research Ethics Commission[8], which regulates research involving human beings. This study is part of a larger project entitled "Health care for people with diabetes mellitus in the city of Fortaleza, Ceará: an integrated approach to epidemiological and clinical aspects and the impact of technology use to reduce morbidity and mortality." It was registered in the online submission system via Plataforma Brasil after approval by the Fortaleza Municipal Health Department. It then underwent processing and approval for execution, as established by the National Health Council. It received a favorable opinion from the Research Ethics Committee of the University of Fortaleza (Unifor), under No. 6,425,849.

Type of study

This methodological study aims to produce an educational tool that objectively, easily, and playfully conveys good foot care practices for the general public, especially those in the Northeast region. The goal is to develop something engaging and creative that sparks interest in reading and, consequently, self-care. Methodological studies conduct in-depth research, organize, and analyze evidence to develop, validate, and evaluate tools and/or instruments, aiming to increase their reliability[9]. Furthermore, they are a research modality that seeks to develop technological strategies that can contribute to implementation and evaluation in educational or healthcare settings[10,11].

Phases, period and place of study

The study was divided into three stages. The first, consisting of bibliographic research, involved an integrative and narrative review, aiming to map the evidence and select it for inclusion in the theoretical text of the cordel. The second stage involved the construction of the educational cordel, and the third stage involved validating the cordel's content and appearance.

The bibliographic research was conducted through a comprehensive investigation of national and international scientific literature on publications relevant to general guidelines for users with diabetes, treatment adherence, and technologies for self-

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care for diabetics. The purpose was to gather existing information and group the most relevant information to compose the cordel in all its nuances, in order to have a consistent database.

The research was conducted in the second half of 2022, with the literature survey taking place during the months of June and August. The construction and assembly of the cordel took fifteen days, from script preparation to adaptation of the first version of the prototype. For this phase, a virtual meeting with the researchers was held via Google Meet to analyze the initial pilot test regarding semantics, simplicity, clarity, relevance, and content present in the cordel. The development and validation of the instrument took place in Fortaleza, Ceará state, Brazil.

Population or sample, inclusion and exclusion criteria

To validate the content and appearance of the cordel, a theoretical evaluation of the construct was conducted by judges specialized in diabetes, primary care professionals who treat individuals with this condition, and nurses specializing in diabetic foot care. The recommended number of judges for validation of this type of study is six to twenty experts[12]. Another author recommends a minimum of five and a maximum of ten[13]. In the present study, invitations were sent to a total of 30 professionals, and the total sample of experts who effectively participated in the study was 23.

Jasper's criteria[14] were followed for the selection of judges, which encompass clinical knowledge and skills in a specific area, including the following requirements: specialized skills/knowledge that establish the professional as an authority on the subject; skills/knowledge acquired through experience; special expertise in a specific type of study; and a high rating from an authority.

Study protocol

The cordel creation stage consisted of two processes: initially, research on the topic was conducted, gathering conceptual and informative elements for integration into the technology. Subsequently, the script for the cordel "João's fight against the wound on his big toe: overcoming diabetic foot" was developed and edited. At this stage, the content from the integrative review conducted in phase 1 was gathered. Through synchronous meetings with the researcher and her advisor, broadcast via the Google Meet platform, permission was granted for the initial construction of the cordel. A cordel writer, a poet, and judges participated in the development of cordels in the healthcare field.

For this stage, a checklist for planning and constructing the cordel was developed, including items such as: the cordel's objective; target audience; the main message to be addressed to the target audience; content to be identified during the reading of the cordel; feelings/emotions expected by the target audience during the use of the technology; which woodcut and color images would be essential for the construction of the cordel and its final textual aspects, as well as the inclusion of audio through

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a QR code for accessibility for patients with some degree of visual impairment or illiteracy.

A graphic designer was hired to create the cordel. The professional collaborated on the creation of the cordel's artwork until its first version was finally ready. After the initial analysis of the cordel's design, the material was revised, comparing the initial ideas with the created material until the researchers achieved the desired result.

For the validation stage, judges were recruited by sharing the link to the electronic form via WhatsApp, taking into account the researchers' network of contacts. Additionally, a "snowball" sampling technique was used, through which recruited participants recommend professionals with the right profile for participation in the research.

The form was sent both via email and WhatsApp. The electronic form created in Google Forms contained the following structure: a letter of invitation to participate in the study, an informed consent form containing clarifications about the study, the judges' educational characteristics, a prototype of the cordel, and an instrument for evaluating the cordel. The Google Forms form was given eight days to complete.

To evaluate the content and appearance of the Educational Cordel, an instrument adapted from Teixeira and Mota[15] was used, with items related to the judges' characteristics; the objectives of the cordel; the structure and presentation of the cordel; and its relevance. The items related to the analysis of the content and appearance of the cordel had the following response options: 1 - agree; 2 - partially agree; 3 - partially disagree; 4 - disagree. For each domain, there was a field for content criticisms (negative points) and content suggestions (positive points).

An evaluation instrument developed based on Doak, Doak, and Root[16] and adapted to the study theme was also used. This instrument assesses the following aspects of the cordel: content, language, graphic illustrations, motivation, and cultural appropriateness. The response options are: 0 - Inadequate, 1 - Adequate, 2 - Partially adequate.

Finally, an instrument created by the researcher was used to assess the clarity and relevance of the cordel regarding the following content topics: symptoms; preventive care; adherence to diabetes treatment; and diabetic foot care. The response options for each question were (1-Does this topic seem clear and comprehensive to you? 2-Is this topic associated with diabetic foot prevention and care?): yes or no.

Análise dos dados

Descriptive statistics were used to analyze the characteristics of the responding judges: year of graduation; specialization; area of specialization; year of graduation (specialist); master's degree; year of graduation (master's degree); doctorate; year of graduation (doctorate); institution of employment; and length of employment (months). Thus, nominal

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variables were described using simple and relative frequencies. Numerical variables were presented using measures of central tendency (mean, median, standard deviation) and separatrices (interquartile range).

To validate the content and appearance of the cordel, a calculation was used in which the content validity index (CVI) score was obtained by summing the agreement scores of the items marked by the judges as "4" or "3" and dividing by the total number of responses. Thus, the CVI was calculated using the following mathematical equations: S-CVI/Ave (average of the content validation indices for all items of the cordel assessment instrument); I-CVI (content validity of each item of the cordel validation instrument); CVI by domain of the cordel validation instrument.

Regarding the use of the Suitability Assessment of Materials (SAM), the CVI was calculated by dividing the total number of responses "2" (Adequate) by the total number of responses. By marking the options "0" (Inadequate) and "1" (Partially Adequate), the item was reviewed. Finally, to validate the clarity and relevance of the cordel topics, the total number of options marked as "yes" was used in relation to the total number of responses. Similarly, the item marked as "no" was reviewed. Valid items were those with inter-rater agreement greater than or equal to 0.80. Furthermore, to verify agreement between judges, the binomial test was used, with agreement being reached when $p>0.05$. The analyses were performed using the Statistical Package for the Social Sciences (SPSS) software, version 23[17].

RESULTS

To achieve the desired results, a thorough integrative and narrative review of the literature on foot self-care recommendations for individuals with diabetes was conducted. This research served as the foundation for designing the content and appearance of the educational cordel. Subsequently, the content and appearance of the cordel were submitted for evaluation by a panel of experts in the field. The final version of the cordel was refined and incorporated the valuable contributions received during the validation process.

Integrative review: tools, devices, booklets, notebooks, and other printed educational materials for self-care practices in diabetic foot prevention

The final sample for this review, detailed below, consisted of eight articles published between 2017 and 2022. A predominance of publications was observed in nursing journals, totaling five studies, two of which were in international journals.

Regarding the research design, there are five methodological studies, two intervention studies, and one cross-sectional study. Among the types of technologies created are two serial albums[18,19], a short film[20], a Distance Learning (EaD) course[21], an application[22] and three group educational projects[23-25]. The technologies were focused on the prevention of diabetic foot. More details are explained in Table 1.

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Table 1 - Summary of main results by year, database, journal (magazine), article title, study objective, type, technology, and focus. Fortaleza, Ceará, Brazil, 2023

DATABASE	Journal (Magaziner)/ear	Article Title	Objective of the study	Type of technology
BDEnf	Revista Cuidarte/2021	Development and validation of a serial album for the prevention of diabetic foot[18]	To develop and validate the content and appearance of a flipchart on diabetic foot prevention for use by primary health care professionals.	Serial Album
BDEnf	Rev Rene/2021	Construction and evaluation of a serial album for the prevention of foot complications in diabetics[19]	To describe the construction process and evaluate the evidence of content and appearance validity of a serial album for the prevention of foot complications in diabetics.	Serial Album
BDEnf	Ciência, Cuidado e Saúde/2021	Educational technology for diabetic foot care and prevention[23]	Outline the methodological path for creating an educational technology for the prevention of diabetic foot.	Process technology with a systematized path: "listen-see-do" using guiding questions and support material
LILACS	*Journal Health*/2021	Contributions of an educational program to prevent foot injuries in people with diabetes mellitus[24]	To evaluate the contributions of an educational program in preventing foot injuries in people with type 2 diabetes mellitus.	Educational work with a single group of the before, after type
SciELO	Revista da Escola de Enfermagem da USP/2019	Educational intervention to promote self-care among elderly individuals with diabetes mellitus[25]	To evaluate the effectiveness of an educational nursing intervention in the self-care of elderly individuals with diabetes mellitus.	Educational work with two groups of the before, after type
SciELO	Revista Brasileira de Enfermagem/2022	Production and validation of the short film Pés que te quero: educational technology for people with diabetes[20]	To describe the production and validation of a short film-type educational technology for the prevention of diabetic foot ulcers.	Film
SciELO	Enfermería Global/2020	Educational module in a virtual learning environment on diabetes mellitus[21]	The objectives of this study were to develop an educational module on diabetic foot in a Virtual Learning Environment - VLE on the Moodle platform for nursing	Distance Learning Course

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			and submit the program to student evaluation.	
SciELO	Acta Paul Enferm/2017	Mobile application for assessing the feet of people with diabetes mellitus[22]	To describe the development and validation process of a mobile application for assessing and classifying the risk of feet in people with Diabetes mellitus.	Applicative

Source: Prepared by the authors (2025).

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Narrative review: results of the literature search on guidelines for self-care practices in the prevention of diabetic foot

To better organize the literature review and understand the content selected for the history of the cordel, a foot care checklist was created, including inspection, hygiene, use of appropriate footwear, and complementary diabetes treatment to prevent decompensation and the risk of diabetic foot.

After the narrative review, important information was selected and organized using index cards to guide the text of the material. The text took into account some unique characteristics of the target audience, with age group being one of the factors considered in the appropriateness of the language, illustrations, and formatting, given that approximately 90% to 95% of diabetes cases are type 2 diabetes mellitus (T2DM), and it is usually diagnosed after age 40[26].

Thus, the material was developed using language accessible to people with the disease, their families, and caregivers, regardless of social class. It also aims to be an attractive tool that sparks public interest through its content and illustrations, as it promotes stimulation, relaxation, excitement, and demonstrations of how care should be provided[27].

Table 2 below presents the list of content selected for the cordel.

Table 2 - General foot care for people with diabetes and described in the Cordel Educativo, Fortaleza-CE, Brazil, 2023

Types of foot care
Inspection
- Use a mirror or ask someone else to help you examine your feet.
- Check your legs and feet daily.
- Check for cuts, cracks, calluses, blisters, wounds, and infections.
- If you experience swelling, heat, redness, itching, pain, or any of the signs mentioned above, go to your nearest health center for evaluation by a healthcare professional.
- Observe the sensitivity of your feet.
Note: If you don't notice that the ground is hot or cold, or if you have calluses, cracks, blisters, or cuts, these may mean your feet are already numb.

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Hygiene
- Wash your feet regularly. Use room-temperature water. Do not soak your feet or use hot water bottles, as this can cause burns. - Dry your feet thoroughly with a soft towel, especially between your toes. - Always keep your skin well moisturized. Use oils or moisturizers, except between your toes. - Cut your nails straight across. Do not remove cuticles or the corners of your nails. - Do not cut calluses or warts.
Use of appropriate footwear
- Always wear comfortable shoes, even at home. - When wearing closed-toe shoes, always wear cotton or wool socks, seamless and elastic. Light-colored socks are preferred. - Inspect and feel the inside of your shoes and socks before putting them on. - At the end of the day, your feet will usually be more swollen, so buy shoes that aren't too tight.
Complementary treatment of diabetes to prevent decompensation and the risk of diabetic foot • Maintain a healthy, balanced diet. • Exercise regularly. • Maintain healthy lifestyle habits (don't smoke and avoid drinking alcohol). • Control your blood sugar levels. • Take prescribed medications as directed.

Source: Research data (2023).

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Cordel Educativo: initial version

Figure 1 - Illustration of the initial version of Cordel, Fortaleza, Ceará, Brazil, 2023

Source: Research data (2023).

Below is a description of all the content listed in Table 3.

Table 3 - Content covered on each page of the Educational Cordel entitled "João's fight against the wound on his big toe: overcoming diabetic foot", Fortaleza-CE, 2023

Part of the Cordel per page	Content described
Front and back covers – 1 and 2	Name of the author, title of the cordel and folkloric figures from the Northeast, cangaço man in traditional costume and foot injury.
Technical sheet and presentation sheet – 3 and 4	Specifications for authorship, technical organization, graphic design, spelling, and editing. The presentation sheet details the objective of the work and states that it was a master's thesis.
Stories and verses from cordel – 5 to 24.	The beginning of a man's story with the outcomes and guidelines for foot care.

Source: Prepared by the authors (2025).

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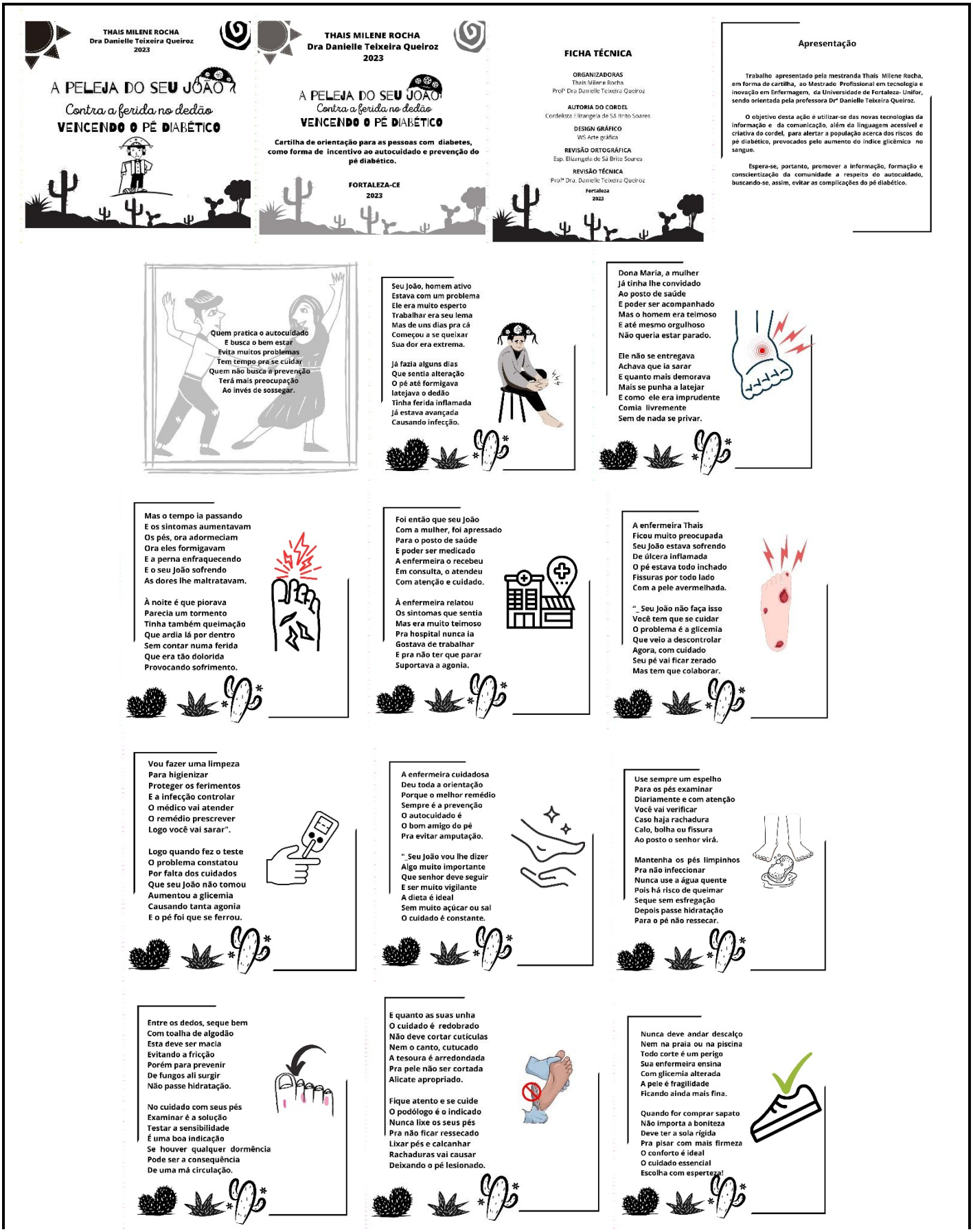
Figure 2 – Final version of the Educational Cordel



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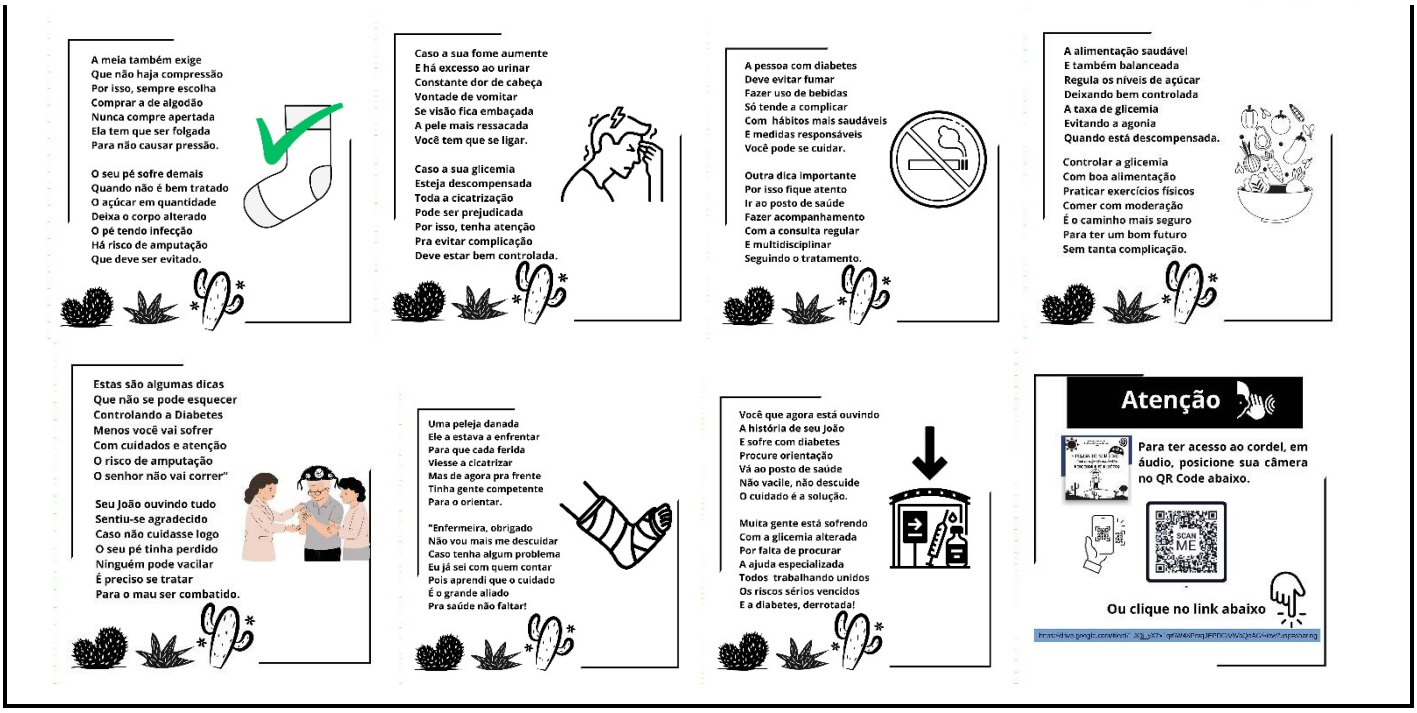

Source: Prepared by the authors (2023).

Validation of the content and appearance of the cordel

Twenty-three judges participated in the study, all of whom were nurses. Of these, 43.5% (n=10) graduated between 2011 and 2020. Regarding postgraduate training, 95.7% (n=22) of the participants had completed specialization; the majority in the areas of Public Health, Family Health, and/or Collective Health, 54.6% (n=12); and they obtained their specialist title between 2011 and 2020, 68.2% (n=15). Furthermore, 47.8% (n=11) had a master's degree and 8.7% (n=2) had completed a doctorate. The majority worked in healthcare, 91.3% (n=21), with an equal division between primary care, 47.8% (n=11), and tertiary care, 43.5% (n=10). The average length of service was 48 months, ranging from 24 to 144 months (Table 1).

Table 1 – Educational profile of judges, Fortaleza, Ceará, Brazil, 2023

Variabçes	N	%
Graduation year		
Before 2000	7	30,4
2000 to 2010	6	26,1
2011 to 2020	10	43,5
Especialization		
Yes	22	95,7
No	1	4,3

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Especialization area		
Public/Family/Collective Health	12	54,6
Education	2	9,1
Others	8	36,3
Year of Degree (Specialization)		
Before 2000	2	9,1
2000 to 2010	5	22,7
2011to 2020	15	68,2
Master's degree		
Yes	11	47,8
No	12	52,2
Year of degree (master's degree)		
2011 to 2020	6	54,6
2021 and on	5	45,4
Doctorate		
Yes	2	8,7
No	21	91,3
Year of degree (doctorate)		
2011 to 2020	1	50,0
2021 and on	1	50,0
Current ocuppation		
Assistance	21	91,3
Teaching	2	8,7
Institution which works		
Primary Attention	11	47,8
Tertiary care	10	43,5
Education	2	8,7
Working time (months)		
Average ± DP*	103 ± 108	
Median (IIQ**)	48 (24 – 144)	

SD: standard deviation; **IQR: interquartile range (25-75).

Source: Survey data (2022).

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When assessing the CVI of the instrument's items, all items were considered validated, achieving CVI>0.80 and p>0.05. The "objective" domain had a CVI=1.00 (95% CI: 0.98–1.00) and p=0.166; the "structure and presentation" domain had a CVI=0.99 (95% CI: 0.96–1.00) and p=0.500. Finally, the "relevance" domain had a CVI=1.00 (95% CI: 0.97–1.00) and p=0.226.

When the binomial test was performed to identify inter-rater agreement, it was observed that, when an agreement level of 80% was established, all items met the agreed level for all responses. The instrument had a CVI=1.00 (95% CI: 0.99–1.00) and p=0.056 (Table 2).

Table 2 – Distribution of instrument items according to objective, structure, presentation, and relevance, Fortaleza, Ceará, Brazil, 2023

Items	**IVC**	**IC95%***		**p-value****
		Inferior limit	Superior limit	
Objective	1,00	0,98	1,00	0,116
Addresses the topic effectively	1,00	0,85	1,00	0,089
Clarifies the importance of the topic	1,00	0,85	1,00	0,089
There is clarity in the information	1,00	0,85	1,00	0,089
Expresses ability to aggregate information	1,00	0,85	1,00	0,089
Portrays important key aspects	1,00	0,85	1,00	0,089
Correctly explains the purpose of the educational booklet (Cordel)	1,00	0,85	1,00	0,089
Empowers individuals to promote health and change behavior and attitudes	1,00	0,85	1,00	0,089
The information is consistent with the needs of individuals with diabetes or at-risk foot	1,00	0,85	1,00	0,089
Reflects the main aspects of diabetic foot prevention	1,00	0,85	1,00	0,089
The illustrations represent the theme in an understandable way	1,00	0,85	1,00	0,089
Structure and presentation	0,99	0,96	1,00	0,500

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The information is scientifically correct	1,00	0,85	1,00	0,089
The language is clear and objective with understandable terms	1,00	0,85	1,00	0,089
The text size and number of screens are adequate	0,96	0,78	1,00	0,315
The content follows a logical sequence and is well structured regarding grammar and spelling.	1,00	0,85	1,00	0,089
The material is appropriate for the sociocultural level of the individuals	1,00	0,85	1,00	0,089
The illustrations are expressive and sufficient	1,00	0,85	1,00	0,089
Relevance	1,00	0,97	1,00	0,226
Emphasizes the key aspect that should be reinforced	1,00	0,85	1,00	0,089
The educational booklet (Cordel) proposes to individuals with diabetes that they acquire knowledge about the prevention of diabetic foot	1,00	0,85	1,00	0,089
Clarifies to the public some issues related to the problem	1,00	0,85	1,00	0,089
Encourages reflection on the subject	1,00	0,85	1,00	0,089
Portrays the necessary aspects for the prevention of sexual violence	1,00	0,85	1,00	0,089
It is suitable and can be used by any professional in educational activities.	1,00	0,85	1,00	0,089
Complete instrument (S-CVI/Ave)	1,00	0,99	1,00	0,056

* Binomial test; **95% CI: 95% confidence interval.

Source: Survey data (2022).

When evaluating the CVI of the SAM items, it was found that all were considered validated, as they obtained a CVI>0.80 and p>0.05. The "content" domain had a CVI=0.93

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(95% CI: 0.84–0.98) and p=0.281; the "structure" domain had a CVI=0.99 (95% CI: 0.92–1.00) and p=0.141; the "graphic illustrations" domain totaled a CVI=0.91 (95% CI: 0.79–0.98); the "motivation" domain had a CVI=0.97 (95% CI: 0.90–1.00); and the "cultural suitability" domain had a CVI=0.98 (95% CI: 0.78–1.00) and p=0.315.

When the binomial test was performed to identify inter-rater agreement, it was observed that, when an agreement level of 80% was established, all items had agreement in at least 80% of responses. The entire instrument obtained a CVI of 0.96 and (95% CI: 0.93–0.98) p=0.350 (Table 3).

Table 3 – Validation of the SAM instrument by the judges, Fortaleza, Ceará, Brazil, 2023

Items	**IVC**	**IC95%***		**p-valor****
		Limite inferior	Limite superior	
Content	0,93	0,84	0,98	0,281
The objective is clear, facilitating the ready understanding of the material	0,96	0,78	1,00	0,315
The content covers information regarding behaviors that help care for and prevent diabetic foot.	0,91	0,72	0,99	0,592
The proposed material is limited to objectives, so that the viewer can reasonably understand it in the time allowed.	0,91	0,72	0,99	0,592
Language	0,99	0,92	1,00	0,141
The reading level is adequate for patient understanding	0,96	0,78	1,00	0,315
The conversational style makes it easier to understand the text	1,00	0,85	1,00	0,089
The vocabulary uses common words	1,00	0,85	1,00	0,089
Graphic illustrations	0,91	0,79	0,98	0,480
The cover attracts attention and portrays the purpose of the material	0,91	0,72	0,99	0,592
Illustrations present key visual messages so the reader can grasp the	0,91	0,72	0,99	0,592

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main points on their own without distractions.				
Motivation	0,97	0,90	1,00	0,300
There is interaction between the text and/or figures and the reader, leading them to solve problems, make choices and/or demonstrate skills	1,00	0,85	1,00	0,089
Desired behavior patterns are modeled or well demonstrated	0,96	0,78	1,00	0,315
There is motivation for self-efficacy, that is, people are motivated to learn because they believe that tasks and behaviors are feasible.	0,96	0,78	1,00	0,315
Cultural suitability	0,98	0,89	1,00	0,064
The material is culturally appropriate to the logic, language and experience of the target audience	1,00	0,85	1,00	0,089
Presents culturally appropriate images and examples	0,96	0,78	1,00	0,315
Complete instrument (S-CVI/Ave)	0,96	0,93	0,98	0,350

*Binomial test; **95% CI: 95% confidence interval.

Source: Survey data (2022).

The technical judges validated all items of the cordel's objectives, and the CVI for this category was 0.95. Two judges suggested adding the importance of continuous multidisciplinary monitoring. Two other judges suggested changing the term "doctor" to refer to the physician, aiming to clarify each professional's category and roles within the healthcare team.

DISCUSSION

Among diabetes control measures, adherence to medication treatment, when necessary, as well as non-medication treatment, stands out. This includes a healthy diet, regular physical activity, and care that can be offered within primary health care by Family Health Strategy (ESF) teams. Although these are simple measures, in some cases, they are poorly followed by the general population and people with diabetes, detrimental to the need for lifestyle changes, which is a complex issue[28].

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One of the main benefits of cordel literature is that it brings the population closer to knowledge on various topics, including diabetic foot care. It should value the cultural aspects of the target audience to foster knowledge acquisition and, thus, adopt healthy habits, enabling healthcare professionals to use it to encourage proactive behavior and improve quality of life[29].

It can be observed that the profile of the specialists, most of whom work in primary care, contributes to better content validation, as these professionals have insight and experience with patients with diabetes. All 20 judges were nurses and held postgraduate degrees in areas related to nursing care or teaching, regarding patient care in primary care.

This profile of judges is similar to that found in a study conducted in Piauí, which aimed to develop and validate the content and appearance of a flipchart on diabetic foot prevention for use by primary care professionals[18]. This study involved seven specialists, with a predominance of nurses with a master's degree (85.7%) and between 5 and 30 years of training (71.4%). All of the judges had experience in teaching, specifically health education, and worked directly with patients with diabetic foot. Six (85.7%) experts presented published research in the area of diabetes mellitus and instrument validation.

The profile of the judges in this study also reflects that of a study conducted in Recife, which aimed to validate an educational technology in the form of a cordel with nursing guidelines on cardiac surgery. The initial sample consisted of 11 judges, including nurses, physicians, and educators with more than three years of experience in surgical nursing, cardiac surgery, teaching, educational technology, and/or cordel literature. The judges also presented scientific literature in the field and experience in instrument validation[30].

A study that aimed to describe the validation of a booklet on foot self-care for people with diabetes and conducted with the participation of 11 nurse judges identified a total CVI of 0.99[31]. The number of judges was smaller than in the present study; however, the CVI found was equivalent to that of the research in this article.

The cordel, titled "João's fight against the wound on his big toe: overcoming diabetic foot," reached its final form, containing 24 pages, including the cover, all with educational illustrations that aid in learning about care.

The literature review guided the development of the technology, with the following topics listed:

- General guidelines for users with diabetes.
- Treatment adherence.
- Technologies for self-care for diabetics.

These topics served as the basis for the cordel's content.

The content presented in the technology provided easy-to-understand language, a conversational style that facilitates understanding, and vocabulary using common words.

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The images were created by a graphic designer hired to create the cordel, who followed the described guidelines. The images chosen are appropriate for reader comprehension and are placed on the pages of their respective explanations.

Regarding formatting, large fonts were used for the text and titles. Regarding diabetic foot care, small, objective texts were chosen to facilitate reader comprehension.

Regarding the judges' evaluation of the cordel, these were of paramount importance in achieving the final result. Some suggestions were accepted for modifications to the content, language, and layout.

The technical judges validated all items of the cordel's objectives, and the CVI for this category was 0.95. Two judges suggested adding the importance of ongoing multidisciplinary monitoring. Two other judges suggested changing the term “doctor” to refer to physician, aiming to clarify the category of each professional and clarify the functions within the health team.

Study limitations

The limitations of this study include the lack of clinical validation of the technology with the target audience and the lack of validation of the audio version of the cordel among judges and people with diabetes. Therefore, future studies recommend validating the written cordel among diabetic patients, as well as adapting and validating the cordel among people with hearing (audiocordel) and visual (Libras) impairments.

Contributions to the area

Nurses play a key role in welcoming patients with diabetes, providing care ranging from health education to developing initial care. Nursing care for people with diabetes is based on developing autonomy in the patient or caregiver, in addition to encouraging lifestyle changes, reducing signs and symptoms of the disease, preventing acute and chronic complications, and promoting an improvement in overall quality of life[32].

Healthcare professionals can use educational technologies to mediate the educational process, fostering interaction between the educator/healthcare professional and the student/user. These educational technologies facilitate more interactive learning and facilitate health promotion actions, enabling the development of knowledge[18,33].

It is important to emphasize that, in communities, the role of the nurse is directly linked to health promotion. Therefore, the cordel created is strongly recommended, as it aims to promote health guidance. It is expected to be a useful technology that contributes to the expansion of knowledge about the prevention of diabetic foot complications.

CONCLUSIONS

The cordel literature developed and validated in this study can be considered to have good reliability and trustworthiness, as it obtained a CVI above 0.90 for all items (content, language, graphic illustrations, motivation, and cultural appropriateness), as well as a total CVI

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of 0.96. The judges' evaluation confirmed this result, demonstrating that the technology is innovative, uses easy-to-understand language, and is relevant for assisting patients with diabetes.

Thus, it is believed that the cordel literature can be safely used by nurses during individual consultations and in collective educational activities with patients with diabetes, enabling the prevention and care of diabetic foot in a playful and inclusive manner. This reaffirms the importance of using cordel literature in healthcare practices and educational activities, facilitating better communication between professionals and patients, promoting the strengthening of self-care for diabetic foot.

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Sarah Feitoza Souza: Contributed to the critical review and analysis of the instrument;

Mayenne Myrcea Quintino Pereira Valente: Contributed to the critical review and analysis of the instrument;

Danielle Teixeira Queiroz: Contributed to the organization and creation of the instrument, as well as to the critical review and analysis of the instrument;

Adriani Zaluski Izoton: Contributed substantially to editing, writing, and critical review, as well as to the translation of the text;

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Declaration of Conflict of Interest

Nothing to declare.

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