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EXPERIENCE REPORT

EDUCATIONAL TECHNOLOGY FOR PEOPLE USING INSULIN

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ABSTRACT

Objective: To build and validate a printed, flipchart-type, educational technology to support educational actions performed by health professionals for people with diabetes using insulin. **Method:** Methodological study comprising three steps: in the first, was defined the bibliographic reference for the construction of the flipchart; in the second, the educational technology was built; in the third, the flipchart was validated by the target audience and expert judges. The technology was submitted to the appreciation of ten target audience participants and ten judges during the validation process. A data collection instrument addressing criteria related to organization, writing style, appearance and motivation was applied to the target audience, and addressing appearance and content to expert judges. The Content Validation Index (CVI) was applied to data. An agreement index of 0.90 was considered for the flipchart validation. **Result:** The global CVI was 1.0 for the target audience and 0.98 for the expert judges. **Final considerations:** The objective of building and validating an educational technology considered suitable for use by its evaluators was achieved in the study. The conclusion is that the flipchart is a tool of great potential in health education for people with diabetes in use of insulin.

Keywords: Educational Technology. Health Education. Insulin. Diabetes Mellitus. Nursing.

INTRODUCTION

Diabetes mellitus (DM) has an epidemic character. According to the Brazilian Diabetes Society, in 2040, the world population will reach 642 million diabetics, 75% of which in developing countries. This increase appears as a consequence of the population aging, prevalence of obesity, urbanization and the higher survival of DM patients[1]. It has important repercussion on public health and expenses with treatments, sequelae related to complications of the disease, and is associated with socioeconomic and demographic factors and other health problems. However, some of these factors are amenable to timely interventions, provided that effective public policies are established, especially health prevention and promotion policies focused on changes in the population's lifestyle[2].

Educational technologies (ET) appear as an action proposal for improving health issues in this scenario from a reflective, creative, transformative, critical and multidimensional perspective between the environment and those involved[3]. Moreover, these are a therapeutic didactic resource that can build the individual's empowerment relationship in the face of the health/disease process and contribute to self-care and quality of life[4].

The development of an ET is justified by the growing number of people with diabetes and weaknesses in knowledge about self-care, application techniques, storage of inputs, insulin application rotation, and the resulting changes such as lipodystrophy, among others[5]. These same difficulties have been found in the Multidisciplinary Service Center located in the city of São José dos Pinhais (PR), which was the scenario of this study. Its professionals assist people diagnosed with diabetes from all the municipal network, who constantly face problems related to the lack of self-care know ledge about insulin use.

This study is relevant given the understanding that nurses are constantly looking for technological resources to support the process of health education throughout their work process, thereby contributing to the construction of subjects as protagonists of their actions[6]. In this context, in a free and targeted online search on the topic performed between September and October 2018, was found a shortage of educational technologies aimed at the public with DM addressing the theme of correct use of insulin that had gone through a validation process.

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The present study fills the existing gap, mainly within public health services, and qualifies the assistance. For being an independent technological resource, the flipchart is an easy to handle and timely didactic resource in the process of individual and collective health education that can be used in the practice of professionals in the various health care points.

Given the above, the objective was to build and validate an ET in the form of a flip chart for people with diabetes mellitus under insulin treatment.

METHOD

A methodological survey[7] was used for the construction of the technology and its validation by the target audience and specialists. For the operationalization of the construction and validation of the flipchart-type ET, the study was divided into three steps: in the first, was assessed the educational knowledge of diabetic patients in insulin therapy; the second step was the construction of the ET itself; and the third was the validation by judges and target audience.

In the first step, the bibliographic reference for the construction of the flipchart was defined. A search was performed between June and September 2018 on websites of the Brazilian Diabetes Society, Brazilian Society of Endocrinology and Metabology, Ministry of Health, National Health Surveillance Agency, American Diabetes Association, American Association of Diabetes Educators, Institute for Safe Medicine Use and insulin medicine leaflets with manufacturers' guidelines. The protocol of the Brazilian Diabetes Society was defined as technical content support because it is scientifically updated, was prepared by renowned expert authors and has references with a degree of recommendation and level of evidence.

In the second step, was prepared the printed version of the ET with illustrations, contextualization with figures, shapes and text to compose the slides; the content of one page was directed to the target audience, while the content of the other page was directed to health professionals. The illustrations and design were made by a design professional, who received guidance on the purpose of each slide. An orientation script was built for the development of this process. It contained the title of each slide, content for the professional, educational objective, image guidance for the patient, text for the patient and guidance. From this script, the designer made the first draft of the slides and sent it for approval by the researcher. After this evaluation, corrections were made until reaching the ideal point.

The flipchart was developed in A3 size (297 x 420 mm) on a foldable cardboard base that enables its fixation in the upright position without danger of falling or closing. When closed, the flipchart can be transported or stored without taking up much space. The upper part contains a spiral, so the pages can be easily turned by the professional at the time of educational guidance, and it is possible to go back and forth whenever necessary. The slides were made of plain paper with a weight of 150g for greater durability and digitally printed on specialized graphics to guarantee the highest quality of the material. At the end, 26 slides were created to compose the flipchart album.

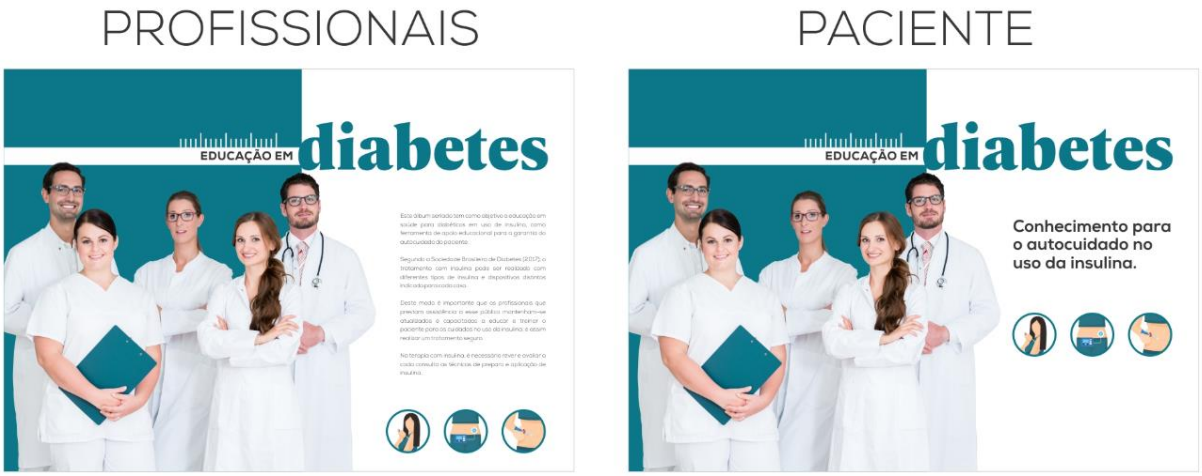

Figure 1. Cover. Curitiba, PR, Brazil (2020).

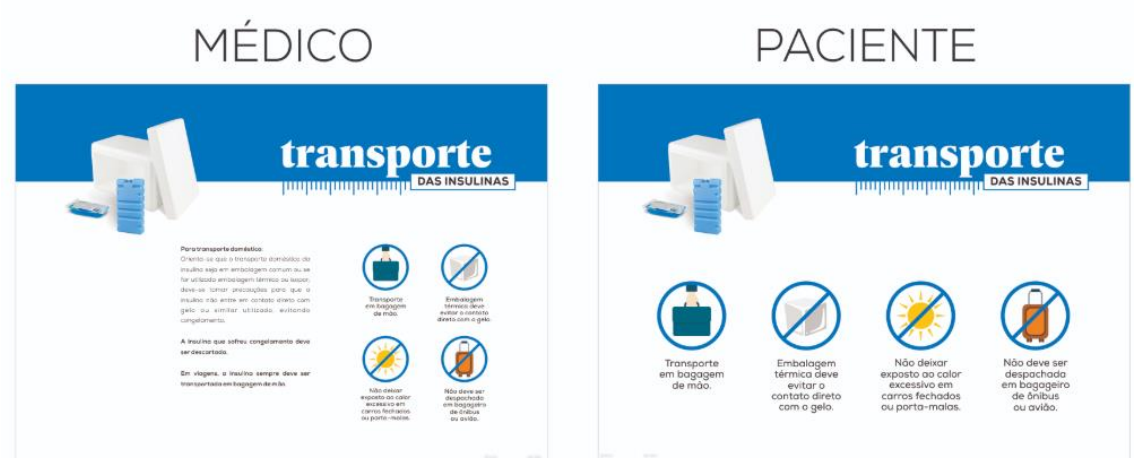

Figure 2. Transport and conservation. Curitiba, PR, Brazil (2020).

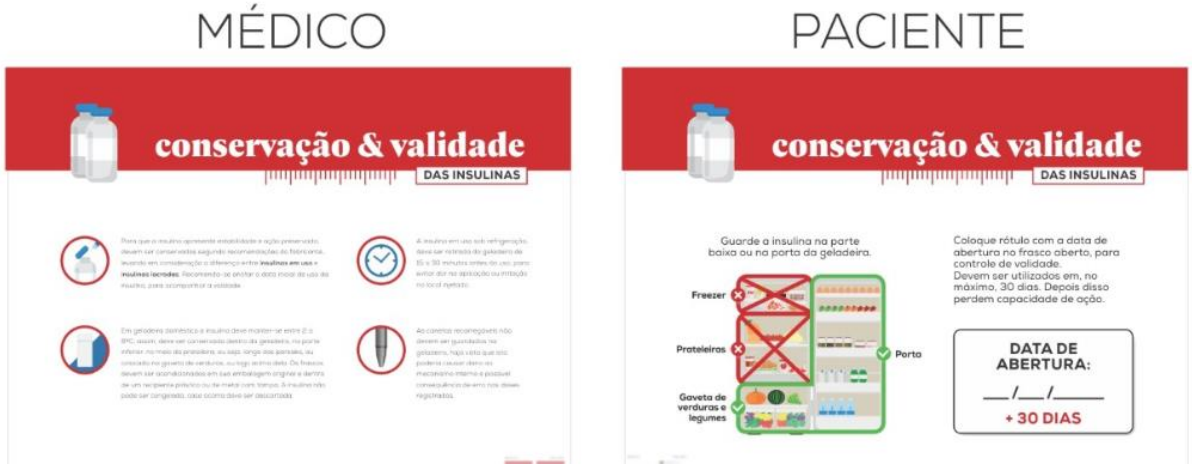

Figure 3. Conservation and expiry date. Curitiba, PR, Brazil (2020).

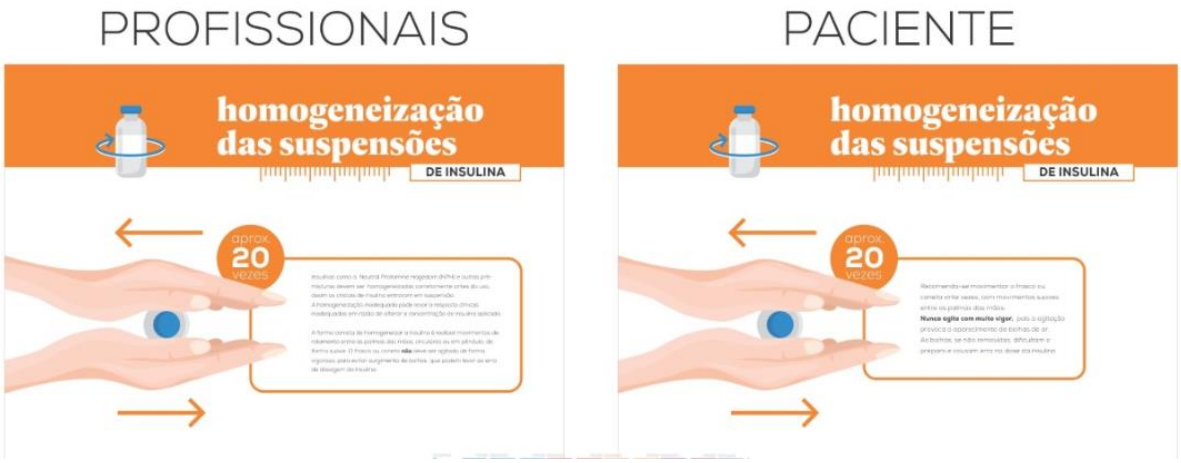

Figure 4. Insulin homogenization. Curitiba, PR, Brazil (2020).

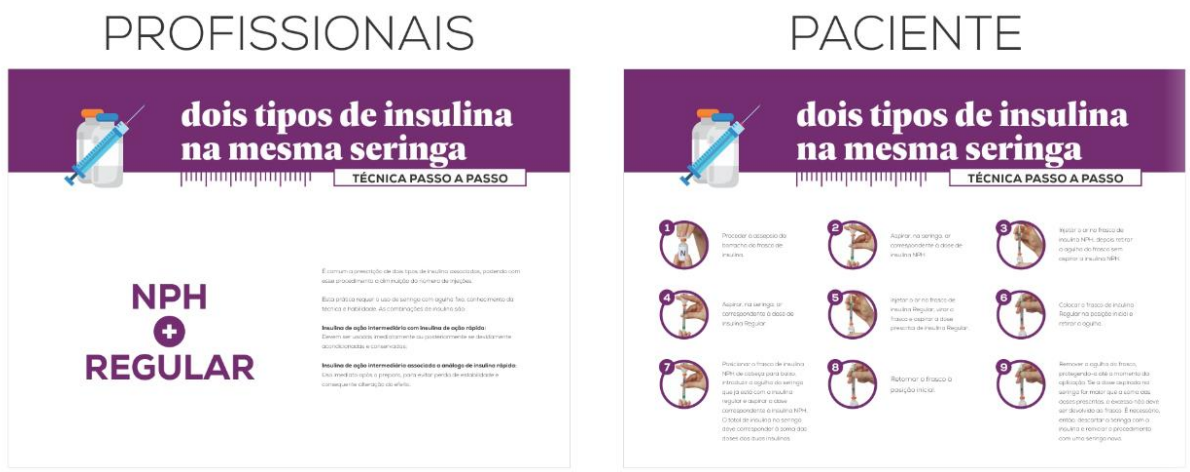

Figure 5. Insulin types in the same syringe. Curitiba, PR, Brazil (2020).

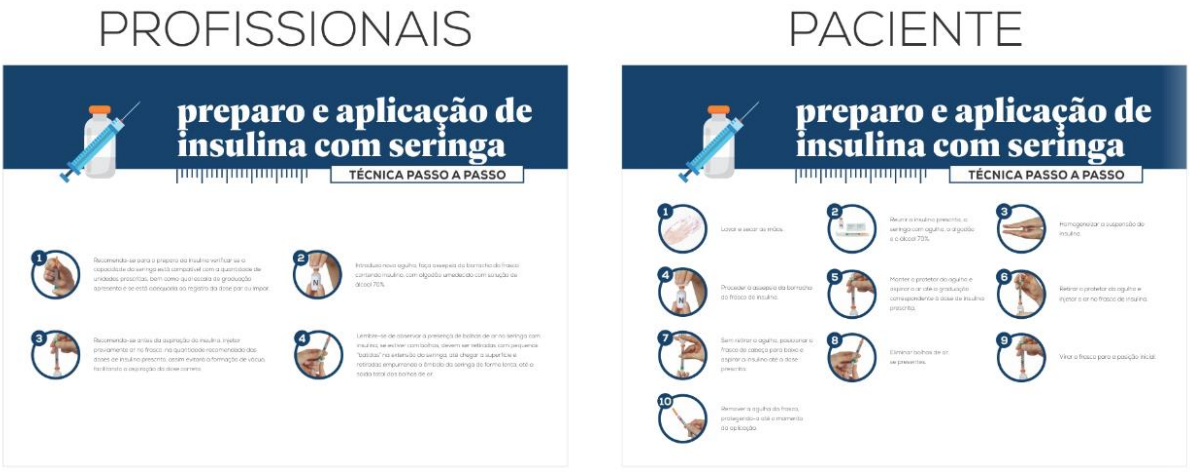

Figure 6. Insulin preparation and injection with a syringe. Curitiba, PR, Brazil (2020).

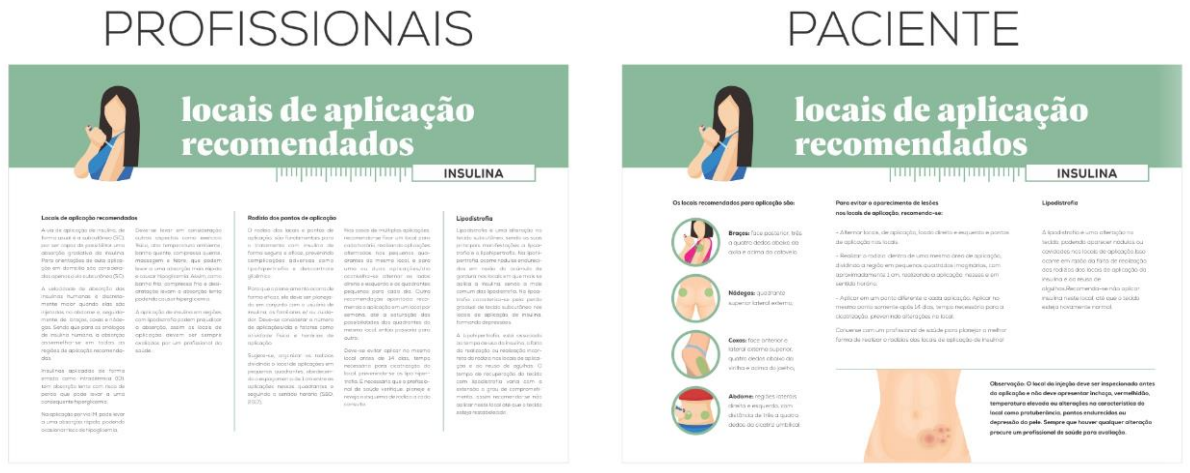

Figure 7. Recommended application sites. Curitiba, PR, Brazil (2020).

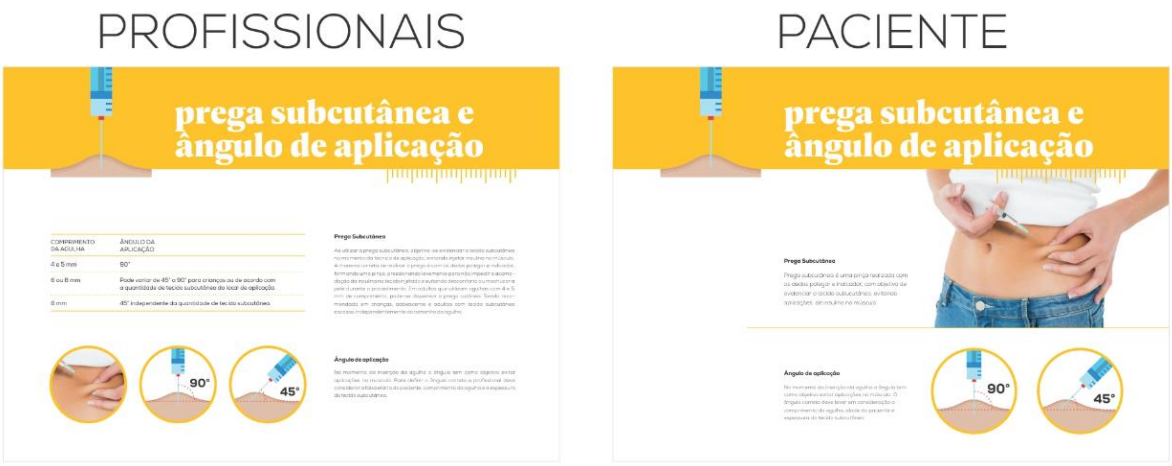

Figure 8. Subcutaneous fold and angle of injection. Curitiba, PR, Brazil (2020).

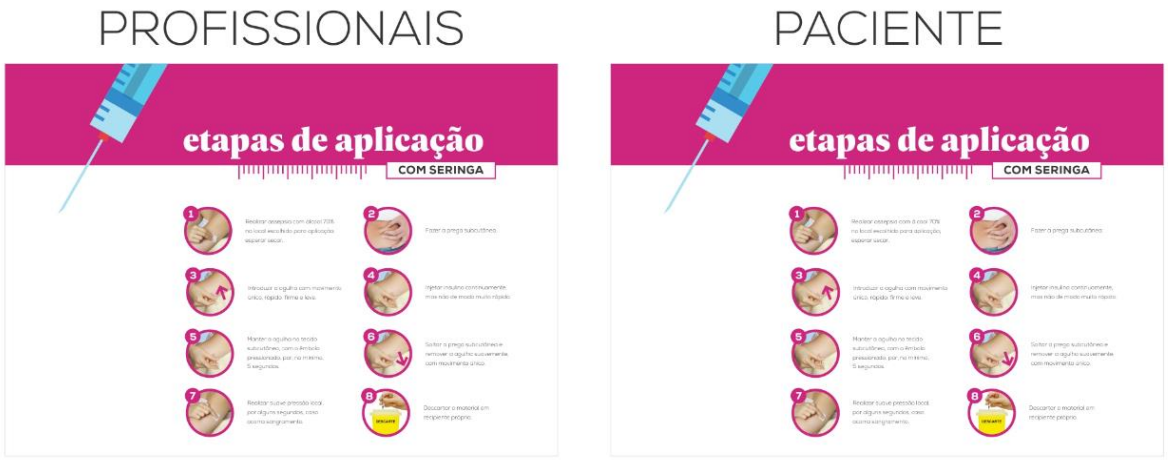

Figure 9. Steps of syringe application. Curitiba, PR, Brazil (2020).

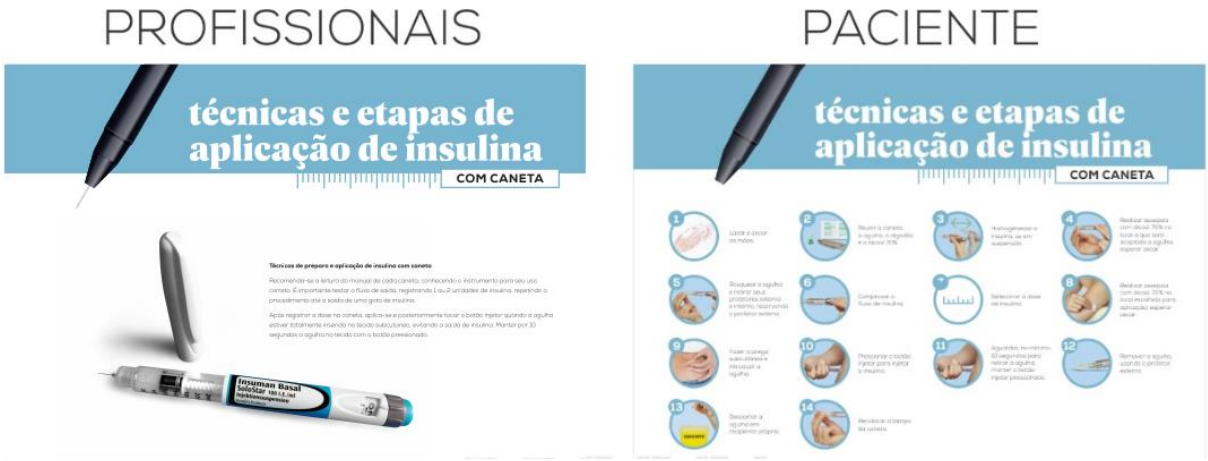

Figure 10. Steps of pen application. Curitiba, PR, Brazil (2020).

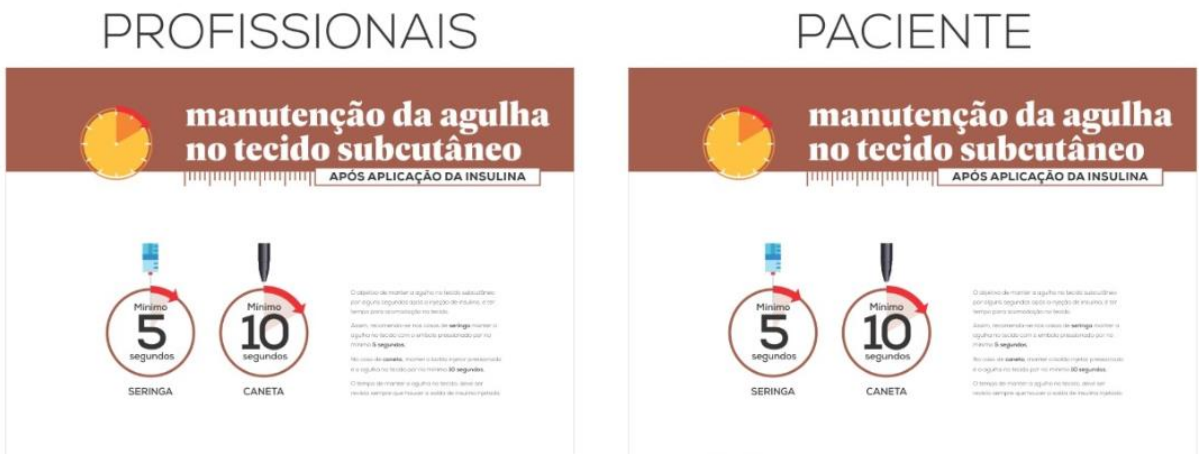

Figure 11. Holding the needle in subcutaneous tissue. Curitiba, PR, Brazil (2020).

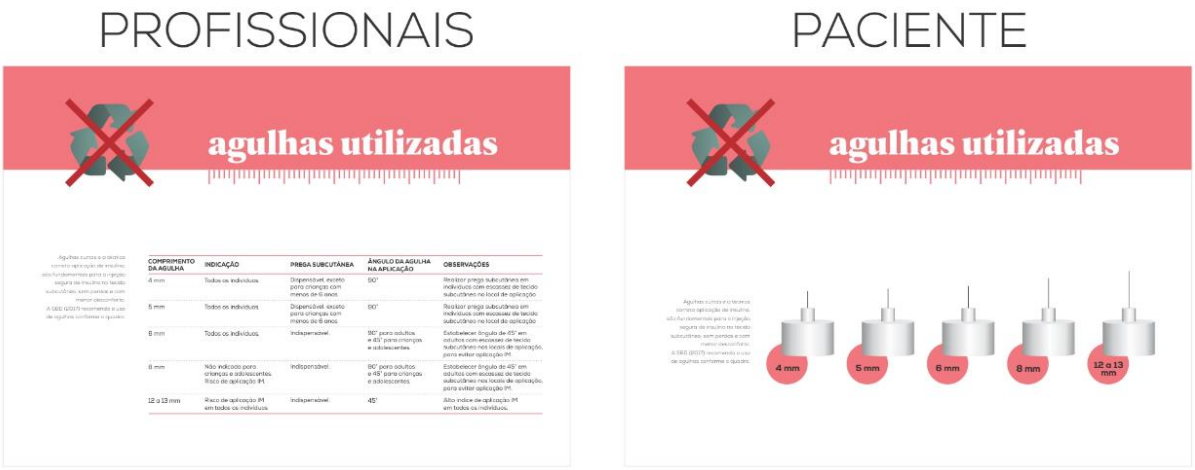

Figure12. Used needles. Curitiba, PR, Brazil (2020).

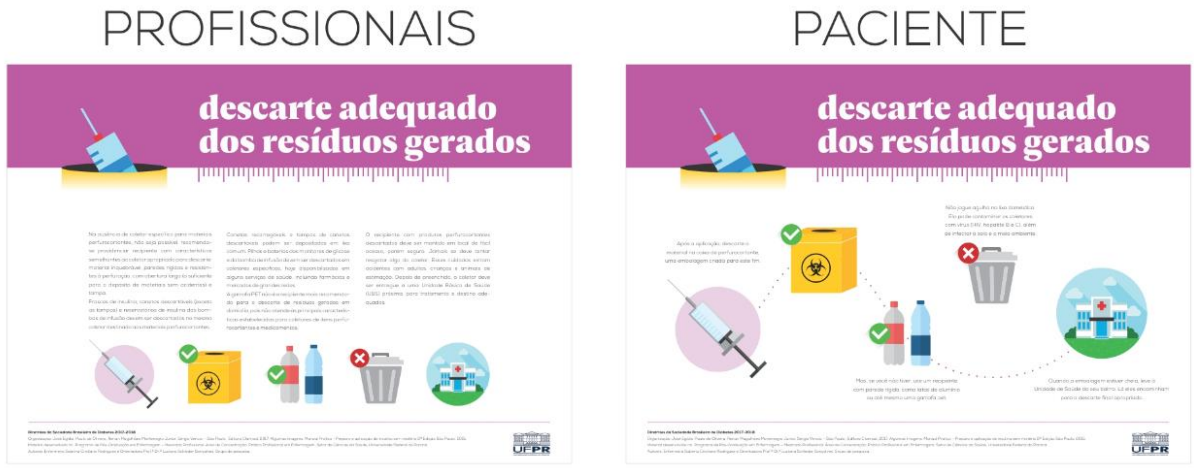

Figure 13. Properwaste disposal. Curitiba, PR, Brazil (2020).

In the third step, the flipchart was validated by the target audience and judges. Ten participants representing the target audience for which the ET is intended performed the face validation, while ten expert judges performed the face and content validation[8,9].

The group of participants in the target audience comprised patients from the endocrinology outpatient clinic and primary care in the municipality of São José dos Pinhais, who met the following inclusion criteria: age over 18 years old; diagnosis of DM for more than a year; and in use of insulin for more than a year. Patients with cognitive difficulties or illiterate were excluded. No approached patient had to be excluded.

The group was approached during nursing consultations that occur routinely after the consultation with the endocrinologist. Patients under follow-up in Basic Health Centers in the municipality also participated. These were approached after follow-up care at the unit and underwent a nursing consultation for guidance on the correct use of insulin. All approached participants received guidance on the correct use of insulin, application and conservation techniques, and those who met the inclusion criteria and accepted to participate in the study were instructed on the objectives of the study and asked to sign the Informed Consent (IC)form. The educational material (flipchart)was presented for their evaluation according to the items proposed in the data collection instrument.

Participants were coded with letters TA (Target Audience), followed by the number corresponding to the order of participation in the study (TA1 to TA10)to ensure anonymity.

The group of judges was composed of professionals from the public health network of São José dos Pinhais working in Primary Care and in the Specialties Center of the municipality. Professionals who met at least three of the following criteria were included: working for more than two years in the care of DM patients; with specialization or residency in the area related to diabetes mellitus; having a Master's or PhD in areas related to the education of patients with diabetes or in the construction and validation of educational technologies; author of publications related to the education of patients, people with diabetes or in the construction and validation of educational technologies; being part of a research/project group involving the education of patients, people with diabetes or the construction and validation of educational technologies; having knowledge about educational technology and/or educational material; having knowledge about diabetes; having knowledge about patient, community and group education[10].

The sample of judges comprised two endocrinologists, two medical residents working at the endocrinology clinic; two nurses specialized in direct care of DM patients; two pharmacists in direct care of diabetic patients; two nurses in primary care management with experience in patient education. Of these professionals, three hold a master's degree and a PhD; the average working time in the area is nine years.

Participants were approached at their workplaces, during their breaks or at times when they were free to participate. In the invitation to participate in the study, subjects were explained about the objectives and all orientations were given. Those who accepted, received the IC form, were asked to sign and subsequently evaluate the flipchart according to the items proposed in the data collection instrument. The initial version of the flipchart was presented and delivered to each participant, who was coded with the letter J (Judge), followed by the number corresponding to the order of participation in the study (J1 to J10) to ensure anonymity.

For validation, a Likert Scale instrument was applied, in which participants evaluated the flipchart by marking (X) one of the alternatives from 1 to 4, being: 1 – Inappropriate; 2 - Partially appropriate; 3 - Appropriate; and 4 - Totally appropriate[10].If the answer was 1 or 2, participants could make notes or suggestions directly on the instrument.

The Content Validity Index (CVI), which measures the agreement of evaluators in proportion to each evaluation criterion of the instrument, was applied to data obtained from application of the data collection instrument (in the validation by the target audience and judges). Items that received scores 1 and 2 were analyzed by the researcher and revised, changed or deleted. Items that received scores 3 and 4 were

evaluated following the CVI formula, and a minimum agreement of 0.90 was reached, as proposed by the authors[8,9].The instruments for the flipchart evaluation were applied to the target audience and judges between May 7 and July 2, 2019.

The research project was approved by the Research Ethics Committee of the Federal University of Paraná under Opinion number 3.374.067/2019, and by the Municipality of São José dos Pinhais, a co-participant institution.

RESULTS

As for the ET evaluation performed by the target audience, Table 1 presents participants' responses to each question of the instrument.

Table 1. Absolute frequency of the target audience's answers to questions of the data collection instrument. Curitiba, 2019.

Questions		Evaluation				CVI
		Inappropriate	Partially appropriate	Appropriate	Totally appropriate	
Objectives	Q1.1	0	0	1 (10%)	9 (90%)	1
	Q1.2	0	0	1 (10%)	9 (90%)	1
	Q1.3	0	0	0	10 (100%)	1
Organization	Q2.1	0	0	1 (10%)	9 (90%)	1
	Q2.2	0	0	1 (10%)	9 (90%)	1
	Q2.3	0	0	0	10 (100%)	1
	Q2.4	0	0	0	10 (100%)	1
	Q2.5	0	0	0	10 (100%)	1
	Q2.6	0	0	0	10 (100%)	1
	Q2.7	0	0	0	10 (100%)	1
Information style	Q3.1.	0	0	0	10 (100%)	1
	Q3.2	0	0	0	10 (100%)	1
	Q3.3	0	0	3 (30%)	7 (70%)	1
	Q3.4	0	0	0	10 (100%)	1
	Q3.5	0	0	2 (20%)	8 (80%)	1
	Q3.6	0	0	3 (30%)	7 (70%)	1
Appearance	Q4.1	0	0	0	10 (100%)	1
	Q4.2	0	0	0	10 (100%)	1
	Q4.3	0	0	1 (10%)	9 (90%)	1
	Q4.4	0	0	0	10 (100%)	1
Motivation	Q5.1	0	0	1 (10%)	9 (90%)	1
	Q5.2	0	0	0	10 (100%)	1
	Q5.3	0	0	0	10 (100%)	1
	Q5.4	0	0	0	10 (100%)	1
	Q5.5	0	0	0	10 (100%)	1
	Q5.6	0	0	0	10 (100%)	1
		0	**0**	**14 (5.3%)**	**246 (94.7%)**	
OVERALL CVI						**1**

LEGEND: TA – Target Audience Q – Question CVI – Content Validity Index.

Participants assigned a value of 3 (appropriate) in 14 responses (5.3%) and a value of 4 (totally appropriate) in 246 responses (94.7%). For the calculation of the overall CVI, the sum of responses 3 and 4 divided by the total of responses was considered, thereby resulting in an overall CVI of 1.0.

Regarding the ET evaluation performed by judges, the answers to each question of the data collection instrument are shown in Table 2.

To calculate the CVI, the results attributed as 3 and 4 were added, then divided by the total number of responses; 33 participants attributed 3 (appropriate) (17%) and 154 attributed 4 (totally appropriate) (81%), resulting in an overall CVI of 0.98. Only three (2%) out of 190 aspects evaluated received a score of 2 (partially appropriate).

Table 2. Absolute frequency of the validation responses by judges to questions of the data collection instrument. Curitiba, 2019.

	Questions	Evaluation				CVI
		Inappropriate	Partially appropriate	Appropriate	Totally appropriate	
Objective	Q1.1	0	0	0	10 (100%)	1
	Q1.2	0	0	0	10 (100%)	1
	Q1.3	0	1 (10%)	4 (40%)	5 (50%)	0.9
	Q1.4	0	0	2 20%)	8 (80%)	1
	Q1.5	0	0	1 (10%)	9 (90%)	1
Structure and presentation	Q.2.1	0	0	4 (40%)	6 (60%)	1
	Q2.2	0	0	4 (40%)	6 (60%0	1
	Q2.3	0	0	0	10 (100%)	1
	Q2.4	0	0	4 (40%)	6 (60%)	1
	Q2.5	0	0	1 (10%)	9 (90%)	1
	Q2.6	0	0	0	10 (100%)	1
	Q2.7	0	1 (10%)	4 (40%)	5 (50%)	0,9
	Q2.8	0	0	4 (40%)	6 (60%)	1
	Q2.9	0	0	0	10 (100%)	1
Relevance	Q3.1	0	0	0	10 (100%)	1
	Q3.2	0	0	1 (10%)	9 (90%)	1
	Q3.3	0	0	1 (10%)	9 (90%)	1
	Q3.4	0	0	0	10 (100%)	1
	Q3.5	0	1 (10%)	3 (30%)	6 (60%)	0.9
OVERALL CVI						**0.98**

LEGEND: J – Judges Q – Question CVI – Content Validity Index

The judge who responded partially appropriate referring to item 1.3 "The flipchart invites and/or instigates a change in the behavior and attitude of people with diabetes towards the use of insulin" justified the response by pointing out that:

> In everyday life, behavior change is much more dependent on constant work than on an instrument or material **(J10)**.

Although this observation was appreciated, it did not interfere in the improvement of the educational material.

First versão | **Version after judge's evaluation**

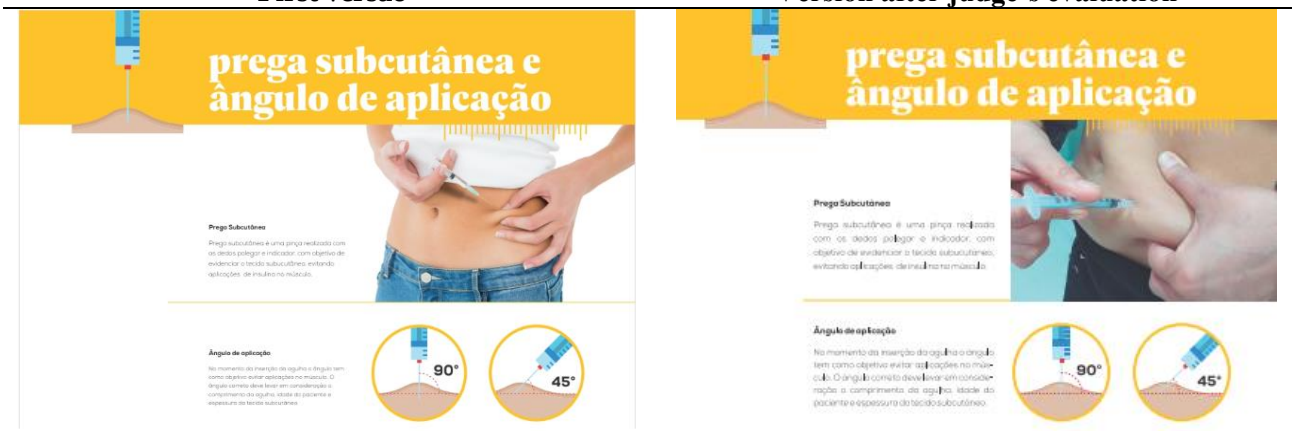

Figure 14 - Slides from the first version of the flipchart and the second modified version. Curitiba, PR, Brazil (2020).

The judge who evaluated question 2.7 "The writing style corresponds to the level of knowledge of the target audience" as partially appropriate justified his answer by stating that:

> The terms are generic and well understood. But using simple keywords would be better. Bigger letters. Making better use of white spaces. Choosing another skinfold model in a patient with more

adipose tissue **(J2)**.

The justifications presented by the judge were accepted for the final version of the flipchart, as they were deemed relevant for improving the material. The images of the skinfold model of slide 12 were modified and the font and images of the whole material for the final version were increased.

The judge who evaluated item 3.5 "The flipchart is suitable for use by any health professional" as partially appropriate justified that:

> There must be minimal knowledge in the area **(J9)**.

Although the comment is relevant to the use of the material, it did not influence the change of any aspect of the flipchart.

DISCUSSION

When constructing the educational material, the needs of health professionals to have pedagogical tools developed based on a scientific framework that support the actions of nurses and other health professionals in the education process were considered. In order to achieve the objective of educational technologies, they must be validated as a scientific product, so their use adds quality care and contributes to change the reality of the target audience[11].

The images chosen were of realistic illustrations with technical characteristics of the topic addressed, aimed at the adult audience, because they should complement the guidelines, encourage, stimulate, make them less dense and facilitate the understanding, as, for some people, illustrations explain better than many words[12]. When building educational materials aimed at health education, legibility and readability must be ensured, in addition to the content selected for the text. The organization and graphic illustration, together with the layout, typography and format of the language used are also important factors to ensure a better understanding by readers[13].

In the validation process, one of the judges indicated that the behavior change is related to constant work. Thus, the need to understand educational technologies as part of knowledge and not an end in the transformation process. Knowledge alone cannot produce changes, especially in behavioral attitudes, so the health team must encourage independence for the development of self-care of individuals[14]. The educational material cannot be seen as an isolated piece in the emptiness of the professional-patient relationship, but as a complement that supports educational, participatory and creative actions, and at the same time, critical and inserted not only in the health context, but also in other social spaces[15].

During the validation process, one of the judges stated that a suitable ET for use by any health professional requires his/herminimal knowledge in the area. The theme addressed in this flipchart represents a part of the orientation and education process aimed at the public with diabetes and other chronic diseases. In this context, the ET is relevant for health professionals engaged in attractive and dynamic educational activities for DM patients and it contributes effectively to health care and promotion of quality of life[16].

The ET instrument developed for the community can improve the quality of care provided to patients and caregivers. However, it cannot represent an end in itself, since it contributes to nurses' clinical judgment by making it possible to prioritize actions of self-care promotion[17].

The flipchart, as an independent educational technology of easy access, allowsthat professionals use it in the various contexts where education is inserted; individual and collective consultations, different points of healthcare and other social spaces. In this context, thereis need for the creation of more technologies such as the flipchart, leaflets, magazines, booklets and others, popularizing the information access by the target audience[17].

FINAL CONSIDERATIONS

The initial objective of the study was to build and validate a flipchart educational technology for people with diabetes mellitus in insulin therapy. It was achieved both by the evaluation of expert judges and the target audience with a CVI of 0.98 and 1, respectively. However, further studies are needed to evaluate the

pedagogical characteristics and effectiveness within the educational principle proposed by the material, as well as its impact on improving blood glucose standards and improving self-carequality in relation to the use of insulin, especially in educational actions of primary health care.

This material represents only part of the educational content that must be addressed in relation to the diabetes topic. Similarly, other technologies must be developed to provide support for health professionals in the context involving patient and community education, with continuous training processes for professionals that consider the diverse knowledge and multidisciplinary practices.

The flipchart built and validated here should serve as a support tool for health professionals who provide care to DM patients using insulin in a continuous process of health education that encourages a mutual dialogue in search for patient autonomy, thereby improving health conditions and adverse events resulting from the lack of knowledge about the correct use of insulin and insulin care.

TECNOLOGIA EDUCACIONAL PARA PESSOAS EM USO DE INSULINA

RESUMO

Objetivo: Construir e validar uma tecnologia educacional, impressa, do tipo álbum seriado para subsidiar ações educacionais de profissionais de saúde para pessoas com diabetes e em uso de insulina. **Método:** Pesquisa metodológica, contemplando três etapas: na primeira, a definição do referencial bibliográfico para construção do álbum seriado; na segunda, a construção da tecnologia educacional; na terceira, a validação do álbum seriado pelo público alvo e juízes especialistas. Na validação, a tecnologia foi submetida à apreciação de dez participantes públicos alvo e dez juízes. Foi aplicado um instrumento de coleta de dados abordando critérios relacionados à organização, estilo da escrita, aparência e motivação para o público alvo, e aparência e conteúdo para os juízes especialistas. Aos dados foi aplicado o Índice de Validação de Conteúdo (IVC). Considerou-se um índice de concordância de 0,90 para validação do álbum seriado. **Resultado:** O IVC global foi de 1,0 para o público-alvo, e de 0,98 para os juízes especialistas. **Considerações finais:** O estudo alcançou seu objetivo de construir e validar uma tecnologia educacional, considerada adequada para uso por seus avaliadores. Conclui-se que o álbum seriado é uma ferramenta de grande potencial na educação em saúde de pessoas com diabetes e em uso de insulina.

Palavras-chave: Tecnologia Educacional. Educação em Saúde. Insulina. Diabetes Mellitus. Enfermagem.

TECNOLOGÍA EDUCATIVA PARA PERSONAS QUE UTILIZAN INSULINA

RESUMEN

Objetivo: construir y validar una tecnología educativa, impresa, del tipo rotafolio para subvencionar acciones educativas de profesionales de salud para personas con diabetes yen uso de insulina. **Método:** investigación metodológica, contemplando tres etapas: en la primera, la definición del referencial bibliográfico para la construcción del rotafolio; en la segunda, la construcción de la tecnología educativa; en la tercera, la validación del rotafolio por el público objetivo y los jueces especialistas. En la validación, la tecnología fue sometida a la evaluación de diez participantes públicos objetivos y diez jueces. Fue aplicado un instrumento de recolección de datos, tratando de criterios relacionados a la organización, al estilo de la escritura, apariencia y motivación para el público objetivo, y apariencia y contenido para los jueces especialistas. Fue aplicado el Índice de Validación de Contenido (IVC) a los datos. Se consideró un índice de concordancia de 0,90 para validación del rotafolio. **Resultado:** el IVC global fue de 1,0 para el público objetivo, y de 0,98 para los jueces especialistas. **Consideraciones finales:** el estudio alcanzó su objetivo de construir y validar una tecnología educativa, considerada adecuada para el uso por sus evaluadores. Se concluye que el rotafolioes una herramienta de gran potencial en la educación en salud de personas con diabetes y en uso de insulina.

Palabras clave: Tecnología Educacional. Educación en Salud. Insulina. Diabetes Mellitus. Enfermería.

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