

Construction and Validation of Educational Technology for Nursing Care in Hypodermoclysis: A Methodological Study

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Theme: Health technologies; promotion of health, well-being, and quality of life; care processes and practices

Contributions to the field: The results may contribute to the improvement of clinical practice and to a wider dissemination of the topic among academic and professional circles. It is hoped that the technology will assist nursing teams by providing technical and scientific support so they can provide qualified, evidence-based care to promote a better quality of life and well-being to patients with compromised venous systems. The construction and validation of this technology have resulted in an easily accessible tool containing consistent information that contributes to the empowerment of nursing professionals regarding the hypodermoclysis technique.

Abstract

Introduction: Hypodermoclysis consists of administering fluids and medications into the subcutaneous space in non-emergency situations, and its use has been shown to be safe and effective. However, there is a scarcity of educational materials on this technique for nursing teams in the Brazilian literature. **Objective:** To develop educational technology for nursing care in hypodermoclysis. **Materials and Methods:** This is a three-stage methodological study: An integrative literature review, the development of an educational tool in the form of a brochure, and the validation of the material by specialists during the pilot phase for final formulation. **Results:** Stage 1: the theoretical framework consisted of 24 articles; Stage 2: the technology was structured around six themes: Definition, indications, types of devices, puncture sites, medications, and general guidelines; Stage 3: validation was conducted with 16 nursing specialists and seven nurses (target audience), yielding the following Content Validity Index (CVI) scores: objective 1.00; content 0.85; language 0.94; relevance 0.95; layout 0.89; motivation 0.97; and adaptability 0.94. The instrument was considered validated in terms of content and presentation, with an overall CVI of 0.93 in a single round. **Conclusion:** This educational brochure-type technology to support nursing care in hypodermoclysis was developed systematically, covering essential content for the safe performance of hypodermoclysis and addressing gaps identified in the literature, particularly regarding the availability of educational resources focused on nursing.

Keywords (Source: MeSH)

Validation study; educational technology; hypodermoclysis; nursing care; palliative care.

4 Construcción y validación de una tecnología educativa para la atención de enfermería en la hipodermoclisis: estudio metodológico

Resumen

Introducción: La hipodermoclisis consiste en la administración de fluidos y medicamentos en el tejido subcutáneo en situaciones no urgentes, y ha demostrado ser una técnica segura y eficaz. Sin embargo, se observa una escasez, en la literatura brasileña, de tecnologías educativas sobre esta técnica dirigidas al equipo de enfermería.

Objetivo: elaborar una tecnología educativa para la atención de enfermería en la hipodermoclisis. **Materiales y método:** investigación metodológica desarrollada en tres etapas: revisión integrativa de la literatura; construcción de una tecnología educativa en formato de folleto; y validación del material por especialistas en una fase piloto para la elaboración de la versión definitiva. **Resultados:** etapa 1 — el aporte teórico estuvo constituido por 24 artículos; etapa 2 — la tecnología se estructuró en seis temas: definición; indicaciones; tipos de dispositivos; sitios de punción; medicamentos; y orientaciones generales; etapa 3 — la validación se llevó a cabo con 16 especialistas en enfermería y siete enfermeros (público objetivo), obteniéndose los siguientes valores del Índice de Validez de Contenido (IVC): objetivo 1,00; contenido 0,85; lenguaje 0,94; relevancia 0,95; diseño 0,89; motivación 0,97; y adaptabilidad 0,94. El instrumento fue considerado válido en cuanto a su contenido y apariencia, con un IVC global de 0,93 obtenido en una única ronda de evaluación. **Conclusión:** La tecnología educativa en formato de folleto para apoyar la atención de enfermería en la hipodermoclisis fue desarrollada de manera sistemática, contemplando contenidos esenciales para la realización segura de la hipodermoclisis y respondiendo a los vacíos identificados en la literatura, especialmente en lo que respecta a la disponibilidad de recursos educativos dirigidos a la enfermería.

Palabras clave (Fuente DeCS)

Estudio de validación; tecnología educativa; hipodermoclisis; atención de enfermería; cuidados paliativos.

Construção e validação de tecnologia educativa para a assistência de enfermagem na hipodermóclise: estudo metodológico

Resumo

Introdução: A hipodermóclise consiste na administração de fluidos e medicamentos no espaço subcutâneo em situações não emergenciais, demonstrando segurança e eficácia em sua utilização. Entretanto, observa-se escassez, na literatura brasileira, de tecnologias educativas sobre a técnica voltada à equipe de enfermagem. **Objetivo:** elaborar tecnologia educativa para a assistência de enfermagem na hipodermóclise. **Materiais e método:** pesquisa metodológica desenvolvida em três etapas: revisão integrativa da literatura; construção da tecnologia educativa, do tipo folder; e validação do material por especialistas na fase-piloto para a formulação definitiva. **Resultados:** etapa 1 — o aporte teórico foi composto por 24 artigos; etapa 2 — a tecnologia foi construída com seis temas: definição; indicações; tipos de dispositivos; locais de punção; medicamentos; e orientações gerais; etapa 3 — a validação ocorreu com 16 especialistas em enfermagem e sete enfermeiros (público-alvo), obtendo-se os seguintes valores do Índice de Validade de Conteúdo (IVC): objetivo 1,00; conteúdo 0,85; linguagem 0,94; relevância 0,95; *layout* 0,89; motivação 0,97; e adaptabilidade 0,94. O instrumento foi considerado validado em seu conteúdo e aparência, apresentando um IVC geral de 0,93 em apenas uma rodada. **Conclusão:** A tecnologia educativa do tipo folder para apoiar a assistência de enfermagem na hipodermóclise foi elaborada de modo sistemático, contemplando conteúdos essenciais para a realização segura da hipodermóclise e respondendo às lacunas identificadas na literatura, especialmente quanto à disponibilidade de recursos educativos voltados à enfermagem.

Palavras-chave (Fonte DeCS)

Estudo de validação; tecnologia educativa; hipodermóclise; cuidados de enfermagem; cuidados paliativos.

Introduction

The hypodermoclysis technique, or subcutaneous therapy, consists of administering fluids and medications into the subcutaneous space in non-emergency situations. After being widely used until the 1950s, the technique gradually lost ground due to a lack of knowledge regarding medications and the subcutaneous use of hypotonic solutions (1).

However, in the 1960s, with the advancement of palliative care in the United Kingdom, hypodermoclysis reemerged as a tool to address the challenges of symptom management in adult and pediatric patients (1, 2). In Brazil, the technique was reintroduced in 2009, following the publication of the subcutaneous route manual by the National Cancer Institute, which highlighted the benefits of this approach for cancer patients (3).

Despite the fact that, in the fields of geriatrics and palliative care, oral administration of medications is generally the route of choice, this option is not feasible in up to 70% of cases. In such cases, intravenous administration may be hindered by aging or vascular compromise resulting from chemotherapy treatments. Thus, the subcutaneous route has become a safe and practical alternative (4-6).

The use of the subcutaneous route for administering medications or infusing solutions is supported by the international literature (7, 8). However, in the Brazilian context, this approach is still rarely discussed in undergraduate programs, which contributes to an unjustified distrust of this practice. The lack of theoretical and practical knowledge regarding subcutaneous therapy limits its use and may result in mechanical trauma, tissue damage, stress, and patient pain. Furthermore, the scarcity of training programs offered by institutions highlights the importance of the nursing team's role in using this method safely and effectively (1).

Hypodermoclysis is an important procedure in palliative care, as the subcutaneous catheter can be safely maintained outside the hospital setting, reducing the risk of infection and lasting longer than venous catheters. Furthermore, complications resulting from the puncture are rare when the technique is adequately followed, respecting both the dilution and the infusion rate of the medications (2, 9). Understanding subcutaneous infusion and its practical application can promote greater acceptance of the procedure, given the benefits for the patient and the family.

Despite the benefits of hypodermoclysis—easy to administer, good cost-effectiveness and safety, preservation of blood vessels weakened by treatments such as chemotherapy and radiation therapy, thereby avoiding dystanasia, and less costly than venoclysis (10, 11)—there are still only a few educational technologies focused on teaching this technique to nursing teams, especially in the Brazilian literature.

Educational technologies encompass a body of scientific knowledge that facilitates the teaching-learning process through the use of tools, methods, materials, or resources that promote knowledge acquisition, skill development, and behavioral change. In addition, they foster evidence-based practice and knowledge sharing, as well as facilitating access to content in situations of uncertainty, thereby aiding in clinical decision-making (12). From this perspective, it is necessary to develop an educational technology that can compile scientific evidence to guide the nursing team in using subcutaneous infusion in daily healthcare practice to implement and disseminate the technique, promote the nursing profession's leading role in providing care to individuals with compromised venous systems, and improve patients' quality of life and well-being.

In this context, this study raises the following question: How can educational technology be developed to support nursing care in hypodermoclysis? Accordingly, the objective of this study is to develop educational technology for nursing care in hypodermoclysis.

Materials and Methods

This is a methodological study that adopted a research design focused on the development, validation, and evaluation of methods, instruments, protocols, or technologies used in professional and scientific practice. It was conducted in three stages: Literature review; development of the educational technology; and validation of the material during the pilot and final phases, following the steps proposed by Polit and Beck (13). The educational technology developed is intended to promote technical and scientific knowledge in a way that is user-friendly and accessible to nursing team professionals for the use of the hypodermoclysis technique.

For the first stage, an integrative literature review was conducted based on the guidelines proposed by the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) (14). Data was collected between June 2023 and February 2024, using a combination of the following terms from the Medical Subject Headings (MeSH): Hypodermoclysis, protocol, clinical, palliative care, nursing care AND patient safety, in search strategies on PubMed, EMBASE, Web of Science, and SCOPUS; in the Virtual Health Library (VHL), using the Health Sciences Descriptors (DeCS): *hipodermoclise, protocolo clínico, cuidado paliativo, cuidado de enfermagem* AND *segurança do paciente*. For data collection, only keywords were used, and synonyms were excluded. A cross-search between keywords was performed using the Boolean operator AND, with the same combination applied across all search engines.

The inclusion criteria were original articles, theses, dissertations, final course papers, and official documents from national and in-

ternational programs published within the last five years and available in full online, with a focus on adults; there were no restrictions on language, country of origin, or research method. The exclusion criteria were articles that departed from the reflections proposed by this study, literature reviews/reflections, editorials, short communications, clinical trial protocols, conference abstracts, epidemiological bulletins, management reports, and books.

For data collection, the RAYYAN® software was used to export data from the studies, including identification, title, publication year, indexing database, journal, abstract, method, results, and conclusion. After compiling the data, the selected material was read in full; the critical analysis and interpretation of the results were conducted independently by two researchers, and any inconsistencies were discussed with the advisor.

The second stage consisted of developing an educational resource in the form of a brochure based on the content identified in the literature review, drawn from scientific articles and specialized literature on hypodermoclysis care. To develop the resource and validate its content, the steps proposed by Lynn (15) were followed: Identification of the domain, generation of items, and development of the instrument.

The following domains were identified through the integrative review: Indication (conditions); care setting (hospital and home); family members' feelings regarding subcutaneous infusion; reasons for discontinuing subcutaneous infusion; advantages and disadvantages; indications in palliative care; types of devices (needle-based or over-the-needle); insertion sites and complications; infused volume; adverse drug reactions; and medications compatible with the subcutaneous route.

Following the identification of the domains, a discussion was held to reach consensus on the items that would comprise the instrument. Five nurses, who are faculty members in the Nursing Department at the Universidade Estadual de Maringá and hold doctoral degrees with experience in the field, participated in this stage. They suggested including information on medication compatibility and emphasizing the use of only one medication per injection site.

Based on the suggestions and considering that this study was intended to be a tool providing quick and easy access to information for consultation during patient care, rather than a guide or manual, priority was placed on objectivity and on data that could effectively support safe and qualified care in the implementation and maintenance of hypodermoclysis. From this perspective, the tool consists of six sections: Definition, indications, types of devices, puncture sites, medications, and general guidelines. To develop the educational material, the Canva PRO® 2.271.0 (2024) tool was used to design the brochure in A3 format (297x420 mm) for printing. It should be noted that this tool was used solely as a resource for the visual design

of the educational material and does not, in and of itself, constitute the educational material.

In the third stage, face and content validation were conducted, following Pasquali's (16) guidelines, with a minimum of seven specialists. Those who had extensive knowledge, skills, and profound experience in the field of palliative care and infusion therapy were considered specialists. This stage is indispensable to the development process, as it allows for an analysis of whether the measures represented in the proposed instrument are truly valid and reliable.

The specialists were selected based on those who met at least one of the following inclusion criteria: holding a specialization, master's degree, doctorate, or postdoctoral degree in the field of interest; or having experience with the thematic fields of palliative care, infusion therapy, oncology, chronic diseases, instrument development and/or validation, and health education. The specialists were identified and contacted using the information available on the Lattes Platform.

The invitation was sent to 45 specialists and seven nurses (the target audience) via an invitation letter emailed to them, which outlined the research objectives and explained how these individuals would participate. After accepting the invitation, the participants received the informed consent form; they were then sent the educational material and a copy of the evaluation questionnaire.

The technology evaluation questionnaire consists of questions regarding the specialist's profile—sex, age, undergraduate degree, academic degree, field of practice, years of experience in the field, teaching experience, and experience with the theme—as well as questions related to overall organization, presentation strategy, formatting, coherence, linguistic characteristics, comprehensibility, writing style, and the relevance of the material. The evaluation was conducted using a Likert scale with four rating levels: 1 = inadequate; 2 = partially adequate; 3 = adequate; and 4 = fully adequate (13–17). Initially, a 15-day deadline was set for returning the evaluation; however, responses were received between 1 and 36 days (average 18 days), which required sending a second invitation via email.

To validate the final version via the target population, registered nurses working in the infusion therapy unit, medical-surgical clinic, and/or intensive care unit of a university hospital were selected. Participants were required to be aged 18 or older, regardless of their length of service in the sector and/or experience providing care to individuals with vascular fragility who require subcutaneous infusion therapy. It is understood that, for the final validation of the educational technology, there is no need for previous experience in this field of knowledge, since the purpose of developing the material is to support nursing care related to hypodermoclysis, thereby helping to standardize the procedures

to be followed. Professionals who were on leave and/or absent from the workplace for any reason were excluded.

For data analysis, the Content Validity Index (CVI) was used; an agreement rate of 80% or higher was considered a validity criterion (18). The calculation was performed by summing the “Adequate” and “Totally adequate” responses from each judge for each item on the evaluation questionnaire and dividing that sum by the total number of responses ($CVI = \text{sum of agreement scores for the items} / \text{total number of responses for the items}$), items rated as “partially adequate” or “inadequate” were revised according to the evaluators’ suggestions (17).

To validate the final version based on feedback from specialists and the target audience, the same evaluation tool was used, with items considered validated if they achieved a 75% level of agreement (19). Finally, the educational technology was submitted to Portuguese language proofreading by a specialized professional. The results were presented organized according to the stages of their development.

The study was conducted in compliance with Resolution 466/2012 of the National Health Council and was approved by the Human Research Ethics Committee of the signatory institution under Opinion No. 6,781,953/2024 (Certificate of Submission for Ethical Review: 78072424.8.0000.0104).

Results

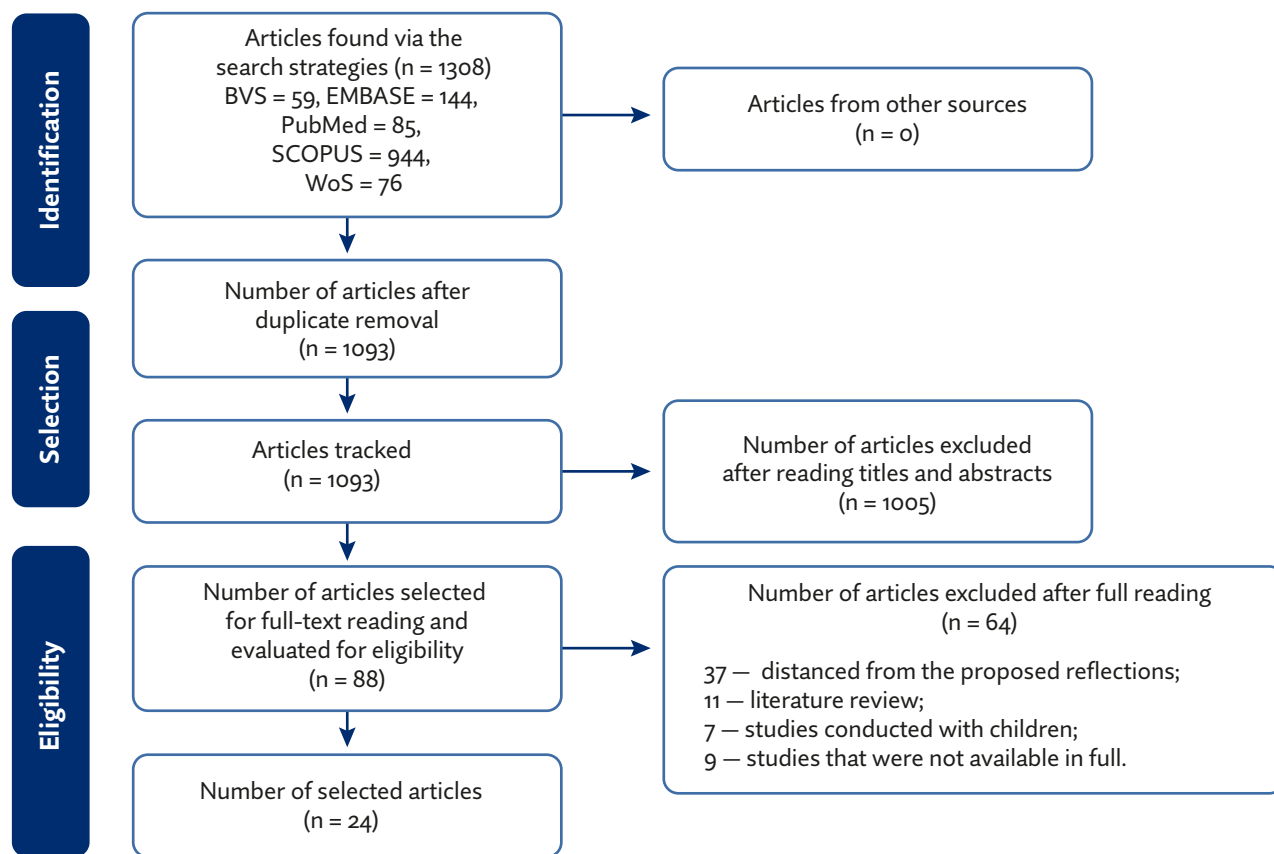
Stage 1

Of the 1308 articles listed, 24 composed the theoretical foundation of the developed technology (Figure 1).

The main indications for the use of hypodermoclysis were dehydration, weakness, nausea, fatigue, and malnutrition, comprising 40% of the literature; poor venous access and multiple attempts represented 20% of the literature, and bacterial infections 13%, analgesia and loss of appetite 8%, and other causes (pain, nausea, weakness, and dehydration) 11%.

Needle-tipped catheters (Scalp®) and over-the-needle catheters (Abocath®) can be used. The most common sites for subcutaneous puncture were the abdominal region (32.5%), anterolateral thigh (25%), pectoral (thoracic) region (20%), interscapular region (15%), and deltoid region (7.5%). When selecting the infusion site, the subcutaneous tissue thickness should be between 1 and 2.5 cm, and the puncture should be performed in a centripetal direction (toward the heart). For the administration of larger volumes, the anterolateral thigh region is recommended, for up to 1500 mL over 24 hours; the abdominal and interscapular regions are recommended for up to 1000 mL over 24 hours. For the infusion of smaller volumes (250 mL/24 h), the pectoral (thoracic) and deltoid regions may be selected.

Figure 1. Flowchart of the Selection Process for Articles Included in the Review. Maringá, Paraná, Brazil, 2024 (n = 24)



Source: Prepared by the authors.

Regarding the classes of medications administered subcutaneously, the studies highlighted: Antiemetics (15.5%), antibiotics (15.5%), opioids (14%), analgesics (13%), antipsychotics (12%), corticosteroids (12%), antipyretics (6%), and benzodiazepines (6%). The drugs enter the bloodstream through passive diffusion, enabling them to be administered as a bolus, either undiluted or diluted in an isotonic solution.

In general, adverse reactions are self-limiting and transient, with a mean duration of 180 minutes, particularly edema (the most commonly observed side effect), and are well tolerated.

Stage 2

The technology consisted of six final sections: (i) definition; (ii) indications; (iii) types of devices; (iv) injection sites and infusion volume for each site; (v) medications: dosage, dilution, and adverse reactions; (vi) general guidelines. Two versions were drafted prior to final approval for submission to specialists and subsequent validation of content and presentation.

Stage 3

The validation of the educational technology was conducted with the assistance of 16 specialists (35% participation rate), with a

mean age of 36.6 years (range: 25 to 64 years). Of these, two held postgraduate degrees; three held master's degrees; and 11 held doctorates in nursing, with teaching experience (n = 14, 86.66%), a mean teaching tenure of 8.8 years (ranging from a minimum of one to a maximum of 27 years), and a mean professional tenure in the field of 15 years (ranging from a minimum of three to a maximum of 42 years).

Following the validation process, the following CVI results were obtained: The “objective” construct achieved a CVI of 1.00; “content”, 0.85; “language”, 0.94; “relevance”, 0.95; “layout”, 0.89; “motivation”, 0.97; and “adaptability”, 0.94. Thus, the instrument was considered validated in terms of content and presentation across all aspects assessed by the specialists, with an overall CVI of 0.93 in a single round of evaluation (Table 1).

Table 1. CVI of the Educational Technology for Nursing Care of Adults and Older Adults Using Subcutaneous Infusion. Maringá, Paraná, Brazil, 2024 (n = 16)

Construct	4	3	2	1	CVI
Objective					1.00
Are the objectives consistent with the needs of the target audience?	8	8			1.00
Does the educational technology help guide nurses regarding the specific care required for hypodermoclysis?	10	6			1.00
Can the educational technology be shared within the scientific community in this field?	10	6			1.00
Can the educational technology promote changes in nurses' behavior and attitudes regarding the care of patients with hypodermoclysis?	8	8			1.00
Content					0.85
Is the educational technology adequate to guide the nursing team in providing the initial and specific care required by patients receiving hypodermoclysis?	9	4	3		0.81
Is the educational technology clear and objective?	10	4	2		0.87
Is the educational technology scientifically sound?	10	4	2		0.87
Is there a logical sequence in the instrument?	9	5	2		0.87
Does the educational technology highlight the importance of careful hypodermoclysis?	7	6	2	1	0.81
Is it clear which aspects warrant attention when treating a patient who requires hypodermoclysis?	9	6	1		0.94
Are the highlighted ideas important and relevant points?	11	2	2	1	0.81
Language					0.94
Is the information presented clear and understandable, given the target audience's level of experience?	8	6	2		0.87
Does the writing style meet the knowledge level of the target audience?	10	5	1		0.94
Is the information well-organized and free of spelling errors?	9	7			1.00
Is the writing used engaging?	8	7	1		0.94

Construct	4	3	2	1	CVI
Relevance					0.95
Does the educational technology content address important aspects that should be reinforced in the care of patients with hypodermoclysis?	10	5	1		0.94
Does the educational technology address the topics necessary for nursing care in hypodermoclysis to prevent errors and/or mistakes in the process?	11	5			1.00
Is the educational technology adequate and can it be used as a tool to promote safe practices for both patients and healthcare professionals?	12	3	1		0.94
Does the educational technology provide guidance to nurses on which procedures to follow when providing care to patients receiving hypodermoclysis?	11	4	1		0.94
Layout					0.89
Is the presentation engaging and well-organized?	9	5	2		0.87
Is the text displayed in an adequate font size?	8	6	2		0.87
Does the font used make the material easier to read?	8	7	1		0.94
Is the information presented adequately?	9	5	2		0.87
Is the scale of the educational technology adequate?	7	8	1		0.94
Motivation					0.97
Is the content motivating and does it encourage continued use?	10	5	1		0.94
Does the content spark interest in using it?	11	5			1.00
Adaptability					0.94
Is the material suitable for the sociocultural level of the target audience?	9	6	1		0.94
General CVI					0.93

CVI: 4 = totally adequate; 3 = adequate; 2 = partially adequate; 1 = inadequate.

Source: Prepared by the authors.

The suggestions for changes made by the specialists to improve the technology focused on three constructs: Content, language, and relevance (Table 2). It is worth noting that most of the suggestions were accepted. Those that were not applied were justified. The target audience consisted of seven nurses, aged 28 to 46 (mean age 35), with 1 to 13 years of experience (mean 9 years), and experience in urgent and emergency care, infusion therapy, palliative care, and patient safety. The overall CVI for the target audience was 0.98: the “objective” construct achieved a CVI of 1.00; “content” 0.96; “language” 0.96; “relevance”, 0.96; “layout” 1.00; “motivation” 1.00; and “adaptability” 1.00. After addressing the recommendations from the specialists and the target audience, the technology is presented as valid both in terms of content and presentation (Figure 2).

Checklist Items	Suggestion	Changes Implemented
Content	Include the angle at which the device is inserted and instructions on what to do in case of side effects.	It was decided to address only the insertion angle due to layout constraints.
	Highlight the main advantages of using hypodermoclysis, revise the writing on venous access to avoid redundancies, and include the impossibility of oral intake as an indication, in addition to listing the contraindications for the technique.	The suggestion regarding the “impossibility of oral administration” was accepted; the others did not address the research objective.
	Add column headings to the medication table as a complement.	Suggestion accepted.
	Include information regarding which healthcare professionals are authorized to perform the puncture and administer hypodermoclysis.	Suggestion accepted.
Language	Add “The puncture should be PERFORMED in a centripetal direction...”	Suggestion accepted.
	Replace the word “weakness” with “asthenia” and “after multiple attempts at puncture” with “a weakened venous network making peripheral puncture impossible.” Replace “medicine” with “medication”.	Suggestion accepted.
Relevance	When viewing the layout at a reduced size, I had some doubts concerning the subtlety of the different shades of blue used to distinguish the medications.	Suggestion accepted.

Source: Prepared by the authors (2024).

Discussion

The development and validation of educational technologies contribute to nursing care in the use of the hypodermoclysis technique, providing an easily accessible tool for consulting well-founded information that supports evidence-based practice.

The literature review (first stage) revealed that hypodermoclysis had been frequently used in older women with various health conditions, particularly cancer and advanced dementia, providing an effective and less costly treatment (adverse events were well tolerated, especially by those with poor venous circulation) for both the patient and the healthcare system, in both hospital and home settings. Although 58% of the studies focused on the use of hypodermoclysis in the hospital setting, this technique promotes continuity of care at home by allowing for medication therapy (curative and/or palliative) in the comfort of the patient’s home and can be administered by well-trained family caregivers (10). However, it should be noted that the technology developed is focused on the hospital setting, regardless of the sector.

HYPODERMOCLYSIS

Administration of medications via
subcutaneous injection in adults and older adults

INDICATIONS

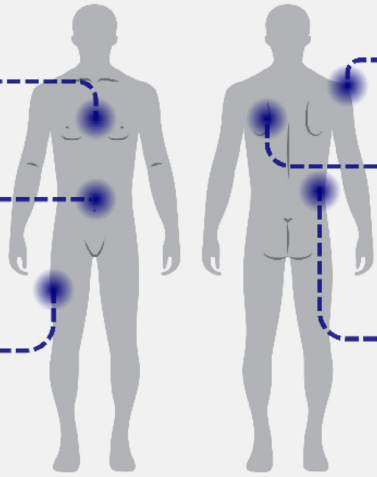
- + Asthenia;
- + Analgesia;
- + Nausea and vomiting;
- + Poor venous access;
- + Dehydration and malnutrition;
- + When oral medication cannot be administered;
- + Weakened venous network, making peripheral venipuncture impossible.

DEVICES

- + **Needle Catheter (Scalp®):**
use number 21G, 23G, 25G, 27G.
**recommended for home use.*
- + **Catheter-Over-Needle (Abocath®):**
use number 18G, 20G, 22G, 24G.
**recommended for hospital use.*

INSERTION SITES AND VOLUME

The puncture should be performed at a 45° angle in a centripetal direction (toward the heart) and in a site with a subcutaneous tissue thickness of at least 1cm to 2.5cm.



Thoracic Region
up to 250mL/24 hours

Abdominal Region*
up to 1,000mL/24 hours
**recommended*

Anterolateral Region of the Thigh*
up to 1,500mL/24 hours
**recommended*

Deltoid Region
up to 250mL/24 hours

Interscapular Region
up to 1,000mL/24 hours

Flanks Region
up to 1,000mL/24 hours

MEDICATIONS

Main medications used, doses, dilutions, and adverse reactions:

☐ Antibiotics

☒ Antiemetic and Gastric Protectors

☒ Opioid Analgesics

☒ Electrolytes

GENERAL INSTRUCTIONS

- + Do not puncture the same site within 24 to 48 hours;
- + The infusion should not exceed 3,000mL within 24 hours;
- + An infusion of up to 2,000mL/24h does not cause local edema;
- + The recommended maximum flow rate is 60mL/hour;
- + Administer only one medication per puncture site;
- + 500mL is enough to ensure the patient's comfort;
- + Should be performed by a trained nurse and supervised by the nursing team.

MEDICATIONS	DOSE	DILUTION	ADVERSE REACTIONS
Ampicillin	1g/24h	SF 0.9% 100mL	Local irritation, redness, bleeding, hardening, and skin necrosis.
Ertapenem	1g/24h	SF 0.9% 10mL	
Ceftriaxone	1g/12h	SF 0.9% 10mL	
Metoclopramide	30mg-120mg/24h	SF 0.9% 50mL	In its pure form, it may cause irritation and pose a risk of precipitation.
Ondansetron	8mg-24mg/24h	SF 0.9% 50mL	
Omeprazole	40mg/24h	10mL distilled water	
Morphine	2mg-3mg/4h (if bolus) 10mg-20mg/24h (continuous infusion)	- SF 0.9% 100mL	Itching, risk of local irritation, irritating at high concentrations, and nephrotoxicity.
Tramadol	100mg-400mg/24h	SF 0.9% 100mL SF 0.9% 20mL (if bolus)	
SF 0.9%	1,500mL/24h	-	Mild redness, swelling, and pain.
SG 5% and 10%	1,000mL/24h	-	

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Reference: BRAZIL. Ministry of Health. **Manual de Cuidados Paliativos**. 2° ed. São Paulo: Hospital Sírio-Libanês; Ministry of Health, 2023.

It is essential to emphasize that the use of technology alone cannot drive changes in care practices; continuous education initiatives are necessary for professional development and for institutionalizing a culture of palliative care strategies to promote patients' well-being (1). These practices are in line with the Minister's Office/Ministry of Health (GM/MS) Ordinance No. 3,681, dated May 7, 2024, which approved the National Palliative Care Policy within the Unified Health System (SUS, for its initials in Portuguese) and establishes the need to promote training, continuous education, recognition, provision, and management of the workforce within the SUS (20).

The ordinance establishes the promotion of improvements in the course of the disease in its physical, psycho-emotional, spiritual, and social dimensions, throughout the entire life cycle (20). From this perspective, the technology developed and validated can be characterized as a strategic tool for managing the physical dimension, providing resources for healthcare professionals to use the subcutaneous route in administering medications that alleviate unpleasant symptoms, such as pain, nausea, and vomiting. Thus, the technology can be used as a resource for training healthcare workers, in addition to being displayed in healthcare settings, so that information is easily accessible to encourage the performance of subcutaneous injections in individuals with poor venous access.

Regarding the nursing team, the nurse stands out as the primary promoter of educational initiatives, especially in the implementation of techniques such as subcutaneous infusion. Through training, nurses promote knowledge of this technique and foster the confidence necessary for the nursing team to assume an active role in providing palliative care (21). The use of educational technologies facilitates understanding and practice, ensuring that all team members develop consistent skills.

It should be emphasized that the technology was validated both in terms of content and presentation in a single round, without the need to employ the Delphi technique. The construct with the lowest IVC index was 'content' (0.85). Although the "content" construct is of paramount importance and has a significant impact on the technology, it was considered validated according to the criteria proposed by Lynn (15). This is due, in part, to the fact that the specialists requested the inclusion of themes/content that go beyond the objectives of this study and, if accepted, would undermine the concept of a tool designed for easy visualization of information, resembling a booklet or clinical protocol.

The content of the first items provides an understanding of what the hypodermoclysis technique is, its main indications, and the most adequate devices to use (items 1, 2, and 3). Item 4, on the other hand, identifies the sites where hypodermoclysis can be performed, the volume that each region can withstand, and the most recommended sites, based on comfort, the ability to tolerate

a higher volume, and/or a lower incidence of adverse events. Item 5 lists the medications most frequently used in palliative care that can be administered subcutaneously (and which stood out most in the literature review — first stage). These were categorized by class (antibiotics, antiemetics/gastric protectants, analgesics/opioids, and isotonic solutions), with details on the recommended doses, dilution methods, and the most commonly observed adverse reactions.

It is worth noting the safety of the subcutaneous route in terms of side effects, as subcutaneous infusion carries a lower risk of inflammatory signs since it is less invasive, while proving effective in controlling symptoms such as pain and dehydration (4, 22). Side effects are well tolerated by patients, as most are self-limiting, mild, reversible, and have minimal clinical impact. For the most part, adverse effects can be corrected simply by reducing the infused volume or changing the puncture site. Thus, the most commonly observed events are edema, erythema, hematomas, local pain, and infiltration (22, 23).

Item 6 highlighted guidelines to be followed to ensure safety in the administration of medications via the subcutaneous route. Mastering the subcutaneous technique, despite its apparent simplicity, requires specialized training to ensure high-quality, minimally invasive care aimed at achieving good outcomes (24).

Finally, among the limitations of this study, the low participation rate of specialists in evaluating the developed technology stands out. It is well known that these professionals, especially faculty members and researchers, accumulate numerous responsibilities that limit their availability to collaborate on other research projects. Another limitation is the difficulty in recruiting professionals with experience in the use of hypodermoclysis.

Concluding Remarks

The educational technology developed for nursing care in hypodermoclysis was validated for content and presentation in a single round. The overall CVI was 0.93, while the CVI obtained from the target audience evaluation was 0.98. The development process was systematic, with organized content, accessible language, clinical relevance, and applicability to nursing care; it was structured into six main items ranging from basic concepts to practical recommendations for the safe performance of the technique. The validation process revealed a high level of agreement between specialists and the target audience, as evidenced by the high CVI scores, confirming the content and face validity of the material produced.

Therefore, this educational technology has the potential to improve the quality of nursing care in hypodermoclysis by contrib-

uting to the standardization of procedures, professional development, and the expansion of the nursing team's knowledge of the technique, thereby facilitating the incorporation of this therapeutic modality into various care settings.

Conflict of interest

The authors declare that there is no conflict of interest.

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