

REVIEWS

Interventions for health education of adults undergoing insulin therapy: A scoping review

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ABSTRACT

Objective: To map in the literature the interventions for health education of adults undergoing insulin therapy.

Methods: Scoping review developed according to JBI recommendations and the PRISMA-ScR checklist. Primary studies and grey literature were included, without temporal or linguistic restrictions. Searches were conducted in eight information sources, with strategies adapted to each one. The selection and extraction of studies were performed by independent and blind reviewers, with disagreements resolved by a third reviewer. Descriptive statistics were used for the analysis.

Results: A total of 16 studies were included. Interventions for health education of adults undergoing insulin therapy were delivered through structured methods, such as interviews, flip charts, games, videos, and educational programs. These interventions were developed for patients receiving follow-up care in primary health care units and during hospital stays. The identified interventions focused on cognitive skills related to insulin administration and attitudes toward self-care.

Conclusions: The identified educational interventions proved to be effective as teaching and learning tools for developing knowledge and skills among patients undergoing insulin therapy. Further studies, with the aim of developing, validating and clinically evaluating other educational interventions, particularly those that explore new types of educational technologies, are needed.

Key Words: Diabetes mellitus, Educational technology, Health promotion, Metabolic syndrome, Type 1 diabetes mellitus

1. INTRODUCTION

Diabetes Mellitus (DM) is one of the major Chronic Noncommunicable Diseases (NCDs), characterized by a metabolic syndrome that results in high serum glucose levels due to partial or total dysfunction in insulin production and/or secretion.^[1]

According to the Pan American Health Organization (PAHO), approximately 62 million people were living with some type

of DM in the Americas in 2019.^[2] Global health projections indicate that, with the gradual and continuous increase in cases, this chronic condition may affect up to 578 million people by 2030.^[3]

This challenging scenario is attributed to modifiable and nonmodifiable risk factors. Among them, an inadequate Lifestyle - including smoking, excessive alcohol consumption, physical inactivity, and obesity - stands out, as these

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behaviors have been associated with cardiometabolic and homeostatic imbalance and, consequently, with the increase in DM cases and its acute and chronic complications, such as poor glycemic control.^[4,5]

Decompensated glycemic levels contribute to reduced Quality of Life, increased healthcare costs, and hospitalizations resulting from multisystem complications. Therefore, understanding both pharmacological and nonpharmacological treatments may help patients achieve better glycemic control, reduce complications, and gain greater independence and self-confidence in performing self-care activities.^[6]

Studies have identified numerous approaches for diabetes education. Complementary educational strategies such as monitoring, educational programs, and educational technologies like videos and booklets can improve QoL and promote desirable health outcomes.^[7,8]

Nurses and other healthcare professionals can employ these educational strategies as mediating tools in the health–disease–care process, enhancing communication and establishing therapeutic relationships with patients. These actions help individuals better manage insulin therapy and achieve improved metabolic control. They also promote the dissemination of reliable information that supports the effective development of knowledge, skills, and attitudes essential for self-care.^[9,10]

Although different educational strategies have been investigated for people with DM undergoing insulin therapy, few reviews have synthesized this evidence. An integrative review identified different health education strategies for people undergoing insulin therapy, including printed materials, individual and group verbal guidance, and audiovisual resources.^[11] However, the review was limited to studies published within ten years and included only eight studies, which may restrict the comprehensiveness of the evidence available on the topic. Additionally, within its temporal limitations, it may not have captured more recent technological advances, particularly those developed during and after the COVID-19 pandemic, a period marked by the intensified use of digital and virtual resources.

In this context, scoping reviews aimed at mapping the educational interventions available for health education among adults with DM undergoing insulin therapy are pertinent. Such approaches can provide a broader overview of their characteristics, formats, purposes, and reported outcomes of these educational interventions. Thus, the findings may contribute to evidence-based educational practices by helping nurses and other healthcare professionals select and incorporate these interventions into clinical practice, thereby

promoting health and ensuring safety in the management of insulin therapy. Moreover, they may help improve the quality of healthcare provided, benefiting patients by strengthening actions aimed at promoting self-care, enhancing quality of life, and preventing health complications.^[10,12]

Furthermore, these studies may help identify gaps in the existing literature that new research can address by developing, implementing, and assessing the effectiveness of educational interventions for individuals with DM undergoing insulin therapy. Thus, this study aimed to map in the literature the interventions for health education of adults undergoing insulin therapy.

2. METHOD

2.1 Type of study, protocol, and registration

This is a scoping review with a research protocol registered on the Open Science Framework (DOI: 10.17605/OSF.IO/W6XH9). The study was conducted in accordance with the recommendations of the Joanna Briggs Institute (JBI)^[13] and reported according to the international guideline Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews Checklist (PRISMA-ScR).^[14]

The development of this study followed these stages: (1) Definition of the objective and formulation of the research question; (2) Establishment of eligibility criteria in accordance with the study objective and research question; (3) Formulation of search strategies, and description of study selection, data extraction, and presentation; (4) Identification of relevant studies through database searches; (5) Selection and mapping of studies; (6) Data extraction; (7) Data analysis; (8) Presentation of results; and (9) Summary, synthesis, and interpretation of data, with the provision of conclusions and implications of findings.^[13]

2.2 Research question

The objective of this review was to map educational interventions developed to promote the health of adults undergoing insulin therapy. For the formulation of the research question, the PCC (Population, Concept and Context) strategy was used, where “P” is adults with DM on insulin therapy; “C” is educational interventions and “C” is health education. Accordingly, the following research question was proposed: “What are the educational health interventions for adults on insulin therapy?”

2.3 Eligibility criteria

Eligibility criteria were defined according to the research question and PCC strategy. Therefore, primary studies, theses, and dissertations that addressed developing, validating

and clinically evaluating educational health interventions for adults with DM undergoing insulin therapy were included. Studies available in full text, regardless of methodological design, publication date, or language, were included. Editorials, letters to the editor, study protocols, conference proceedings, literature reviews, and studies that did not answer the research question were excluded.

2.4 Information sources

The literature search was conducted from April to May 2024 and updated in May 2025, using the following databases: Cumulative Index to Nursing and Allied Health Literature (CINAHL), Cochrane Library, Online Medical Literature Analysis and Retrieval System (PubMed/MEDLINE), PubMed Central (PMC), Web of Science, EMBASE, Latin American and Caribbean Health Sciences Literature (LILACS), and Scientific Electronic Library Online (SciELO). These databases were accessed through the CAPES Journals Portal via the Federated Academic Community (CAFe) login system, using institutional access provided by the Federal University of Ceará (UFC) and the University for International Integration of the Afro-Brazilian Lusophony

(UNILAB). Gray literature was searched through the Brazilian Digital Library of Theses and Dissertations (BDTD), the CAPES Theses and Dissertations Catalog, ProQuest, and Open Access Theses and Dissertations (OATD). Additionally, the reference lists of the included studies were screened to identify relevant studies not retrieved through database searches.

2.5 Search strategy

Search strategies were developed using controlled terms and keywords from the Health Sciences Descriptors (DeCS), Medical Subject Headings (MeSH), CINAHL Headings, and Embase Headings, complemented by keywords identified through a preliminary review of studies on the topic. Based on the results retrieved, the most appropriate combinations were selected and adapted to the specific characteristics of each source. This approach aimed to develop comprehensive search strategies and maximize the retrieval of relevant studies. For the gray literature, preliminary combinations of DeCS, MeSH, and keywords were also tested to identify potentially relevant sources (see Table 1).

Table 1. Search strategy according to databases used for the scoping review. Fortaleza, Ceará, Brazil, 2025

Database	Research strategy
PubMed/Medline, Web of Science, Cochrane Library, SciELO e LILACS	("Diabetes" OR "Diabetes Mellitus" OR "Diabetes Mellitus, Type 1" OR "Diabetes Mellitus, Type 2" OR "Type 1 Diabetes Mellitus" OR "Type 2 Diabetes Mellitus" OR "Insulin-dependent Diabetes Mellitus" OR "Insulin-Dependent Diabetes Mellitus 1" OR "Insulin Dependent Diabetes Mellitus 1") AND "Insulin Therapy" AND ("Health Education" OR "Community Health Education" OR "Patient Education" OR "Education of Patients" OR "Patient Education as Topic")
Embase e Scopus	("Diabetes" OR "Diabets" OR "Diabetes Mellitus" OR "Diabetes Mellitus Type 1" OR "Diabetes Mellitus, Type 1" OR "Diabetes Type 1" OR "Diabetes Mellitus Type 2" OR "Diabetes Mellitus, Type 2" OR "Insulin Dependent Diabetes Mellitus" OR "Insulin Dependent Diabetes" OR "Insulin-Dependent Diabetes Mellitus") AND ("Insulin Therapy" OR "Insulin Treatment") AND ("Health Education" OR "Community Health Education" OR "Patient Education" OR "Education of Patients" OR "Patient Education as Topic")
CINAHL	("Diabetes" OR "Diabetes Mellitus" OR "Diabetes Mellitus, Type 1" OR "Diabetes Mellitus, Type 2" OR "Type 1 Diabetes Mellitus" OR "Type 2 Diabetes Mellitus" OR "Insulin Dependent Diabetes Mellitus" OR "Insulin-Dependent Diabetes Mellitus") AND "Insulin Therapy" AND ("Health Education" OR "Community Health Education" OR "Patient Education" OR "Education of Patients" OR "Education of Patient" OR "Patient Teaching" OR "Patient Education as Topic")
BDTD	("Diabetes" OR "Diabetes Mellitus" OR "Diabetes Mellitus Tipo 2" OR "Diabetes Mellitus Tipo 1" OR "Diabetes Mellitus 1 Dependente de Insulina" OR "Diabetes Mellitus Insulinodependente") AND "Insulinoterapia" AND ("Educação em Saúde" OR "Educar para a Saúde" OR "Educação para a Saúde" OR "Educação para a Saúde" OR "Comunitária Educação Sanitária")
CAPES Catalog	"Diabetes Mellitus" AND "Insulinoterapia" AND "Educação em Saúde"
OATD e ProQuest	("Diabetes" OR "Diabetes Mellitus" OR "Diabetes Mellitus, Type 1" OR "Diabetes Mellitus, Type 2" OR "Insulin-dependent Diabetes Mellitus") AND "Insulin Therapy" AND ("Health Education" OR "Community Health Education" OR "Patient Education" OR "Education of Patients" OR "Patient Education as Topic")

2.6 Study selection

Two independent researchers conducted the search, selection, and analysis processes. A third independent researcher resolved any disagreements. Initially, the studies were identified in the databases and exported to Rayyan, where duplicate records were removed. Subsequently, an initial title and abstract screening was conducted to preselect publications meeting the established eligibility criteria. The studies preselected in this stage were subsequently read and fully analyzed by the independent researchers. Those that met the inclusion criteria were selected and comprised the final sample of the review.

2.7 Data extraction, analysis, and presentation

The studies included in the final sample of the review were read and analyzed in full by two independent reviewers. Both reviewers independently extracted the data using a standardized form and subsequently compared their findings. Extracted descriptive data included authors, language, country,

objective, study design, sample. Additional extracted information included educational intervention used, intervention format (individual, group); classification of the intervention (soft technologies, soft-hard technologies, and hard technologies) according to the framework proposed by Merhy and Feuerwerker (2016);^[15] evaluated outcomes and main findings. To organize and structure the information, the data were compiled into tables and figures and analyzed descriptively.

3. RESULTS

Figure 1 presents the results of the screening and selection of studies covering interventions for health education of adults on insulin therapy. Searches of information sources identified 2,440 article records in the databases and 88 documents retrieved from the grey literature. Of these, 157 duplicates were excluded. After screening titles and abstracts, 93 articles and six documents were read in full. Among them, 16 studies met the inclusion criteria and were included in the review (see Figure 1).

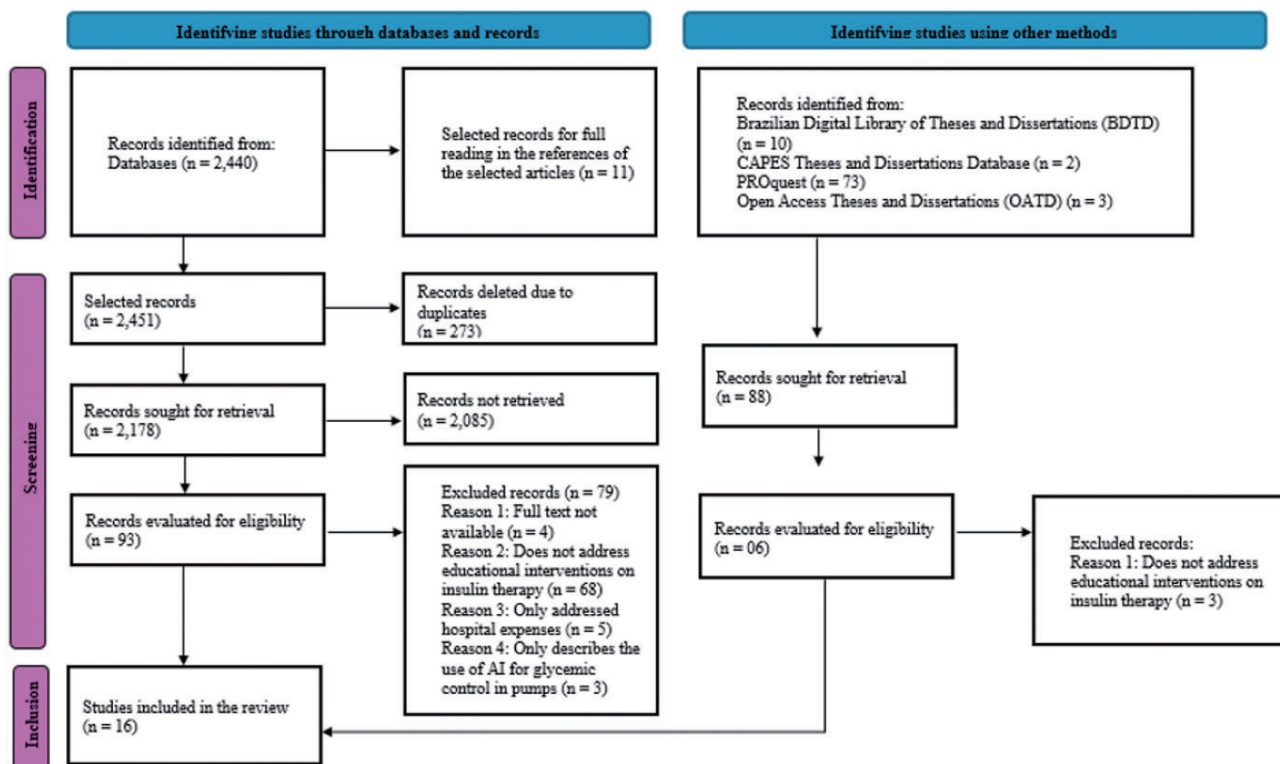


Figure 1. Flowchart of the study selection process. Fortaleza, Ceará, Brazil, 2025

The studies were published between 2014 and 2024, with eight published in the last three years. English was the predominant language (n = 13), followed by Portuguese (n = 2) and Mandarin (n = 1). Eight different nations were represented. China was the most prevalent country (n = 7), followed by Brazil (n = 3), United Kingdom (n = 1), Turkey

(n = 1), South Korea (n = 1), Italy (n = 1), India (n = 1), and United States (n = 1). In terms of study design, most were randomized clinical trials (n = 9), followed by quasi-experimental studies (n = 4), methodological studies (n = 3), and multimethod designs (n = 1) (see Table 2).

Table 2. Characterization of the studies included in the review. Fortaleza, Ceará, Brazil, 2025

Id	Authors	Language/Country	Objective	Study design	Sample
E1	Celik et al. (2014) ^[16]	English/Turkey	To improve the knowledge and skills of patients with diabetes regarding insulin injections using short message service (SMS) via mobile phones and to evaluate the association of this intervention with metabolic outcomes.	Quasi-experimental	n = 221
E2	Chanchan et al. (2015) ^[17]	Chinese/China	To explore whether an insulin use interview tool can reduce psychological insulin resistance, promote treatment adherence, and improve the effectiveness of blood glucose control in outpatient patients with diabetes who are initiating insulin therapy for the first time.	Randomized clinical trial	n = 72
E3	Patel et al. (2015) ^[18]	English/United Kingdom	To develop and test the feasibility and effectiveness of an interactive DVD addressing misconceptions about insulin treatment in type 2 diabetes within South Asian communities, aimed at educating patients and community members and training healthcare professionals.	Multimethod	n = 43
E4	Huang et al. (2017) ^[19]	English/China	To explore the effectiveness of two types of health education in improving diabetes and insulin injection knowledge, insulin injection skills, self-efficacy, satisfaction with health education, and levels of glycated hemoglobin (HbA1c) and creatinine among patients with type 2 diabetes who initiated insulin therapy using an injection pen.	Randomized clinical trial	n = 42
E5	Brilhante (2018) ^[20]	Portugues/Brazil	To develop and validate a flipchart on insulin therapy using a Continuous Subcutaneous Insulin Infusion (CSII) system.	Methodological	n = 18
E6	Rodrigues (2019) ^[21]	Portugues/Brazil	To design, develop, and validate an educational technology in the form of a flipchart for patients with Diabetes Mellitus undergoing insulin therapy.	Methodological	n = 20
E7	Huang et al. (2021) ^[22]	English/China	To evaluate the effectiveness of a nurse-led online educational program based on patients with Diabetes Mellitus treated with initial basal insulin therapy.	Quasi-experimental	n = 672
E8	Zhu et al. (2022) ^[23]	English/China	To compare the effectiveness of video-based and paper-based materials used for educational instruction on the first insulin injection for patients with diabetes.	Randomized clinical trial	n = 110
E9	Gentile et al. (2021) ^[24]	English/Italy	To evaluate the durability of the effects of structured education by monitoring injection habits and metabolic outcomes for an additional six months among well-trained participants from the ISTERP-1 study, randomly assigned to intervention and control groups.	Randomized clinical trial	n = 158
E10	Lee et al. (2022) ^[25]	English/South Korea	To determine the effectiveness of a remote intervention for glycemic control in adults with type 1 diabetes using flash glucose monitoring.	Randomized clinical trial	n = 36
E11	Huang et al. (2022) ^[26]	English/China	To evaluate the effect of a multimedia insulin injection pen-based health education intervention on patients' insulin injection skills, glycated hemoglobin levels, and the time spent by nurses on insulin injection education.	Randomized clinical trial	n = 72
E12	Steenkamp et al. (2024) ^[27]	English/United States	To improve patient access to training on automated insulin delivery (AID) systems and overcome clinical inertia related to referral.	Quasi-experimental	n = 97
E13	Peng et al. (2024) ^[28]	English/China	To explore the effectiveness of a nursing project in improving the accuracy of self-administered insulin injections in patients with Diabetes Mellitus	Randomized clinical trial	n = 200
E14	Lu et al. (2024) ^[29]	English/China	To investigate the impact of comprehensive health education on insulin therapy outcomes in patients with diabetes.	Randomized clinical trial	n = 130
E15	Gavli et al. (2024) ^[30]	English/India	To assess and re-educate patients and caregivers on best practices for insulin injection administration, including selection of the ideal needle or syringe type, appropriate use of a raised skin fold when necessary, injection site rotation, insulin storage and expiration, single-use needle practices, and adherence to recommended injection techniques.	Quasi-experimental	n = 100
E16	Castro (2024) ^[31]	Portuguese/Brazil	To develop a series of educational videos on home-based insulin therapy for individuals with Diabetes Mellitus, including both hearing and deaf audiences.	Methodological	n = 27

Among the educational interventions identified, the predominant approaches involved the use of soft and soft-hard technologies, such as professional follow-up through text messaging and phone calls, interviews, multimedia-based educational programs, flip charts, and video series. These interventions were found to be potentially effective for educating patients undergoing insulin therapy, both at the time of insulin administration and after three and six months of follow-up. In addition, one study demonstrated the validity

of an educational technology designed for individuals with hearing impairment.

Furthermore, it was possible to demonstrate how different countries employ health education strategies to improve insulin adherence, knowledge, and administration technique. Figure 2 illustrates this spectrum, represented by a continuous arrow moving from “in-person” (on the left) to “digital” (on the right), symbolizing the transition from traditional teaching methods to the use of digital technologies.

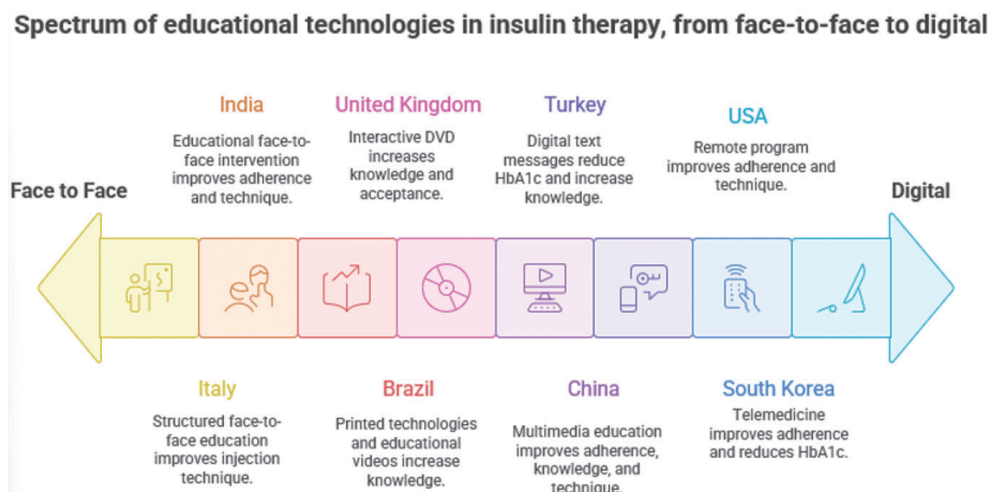


Figure 2. Spectrum of educational technologies in insulin therapy, from in-person to digital. Fortaleza, Ceará, Brazil, 2025

Seven studies reported glycemic control as their primary outcome^[16,17,22,25,27–29] six focused on knowledge or injection technique;^[16,19,23,26,28,30] four addressed attitudes, perceptions, and acceptance regarding insulin use;^[18,22,23,31] three evaluated treatment adherence;^[17,22,29] and three studies focused on the validation of educational technologies^[20,31] (see Table 3).

Furthermore, patterns were observed between the type of technology used and the educational outcomes targeted among patients. Digital tools such as text messages, video calls, mobile applications, and online games^[16,22,23,25,27,31] primarily focused on improving knowledge and treatment adherence. Similarly, audiovisual resources including DVDs, videos, tapes, and multimedia materials^[18,19,23,26] targeted knowledge, skills, and attitudes. Printed and visual materials, such as flip charts and educational booklets,^[20,21] mainly focused on attitude. Finally, in-person interventions, including interviews, consultations, discussion groups, and courses,^[17,28–30] effectively addressed attitudes, knowledge, adherence, and skills.

4. DISCUSSION

This scoping review mapped interventions in the literature for educating adult DM patients undergoing insulin therapy.

Most studies used an experimental design, highlighting the effectiveness of different intervention types, particularly soft and soft-hard educational technologies, aimed at improving knowledge, skills, adherence, and attitudes.

In many contexts, individuals with DM and their families who perform insulin therapy at home face challenges related to the proper storage, preparation, administration, and disposal of insulin materials. A considerable portion of these individuals demonstrate deficiencies in both knowledge and practical execution of these processes, leading to errors that may compromise treatment efficacy and increase the risk of complications.^[32]

Educational technologies in health interventions have shown significant benefits for individuals with diabetes, including improved satisfaction and disease management, as well as reductions in postprandial glycemic averages. These resources facilitate learning and make self-care practices more dynamic.^[33]

Accordingly, this review identified various interventions that may support the educational process for patients and their families. These health technologies can be classified as soft, soft-hard, or hard technologies, depending on their relationship with the type of work performed.^[15]

Table 3. Main outcomes and focus of the technologies used to promote the health of adults undergoing insulin therapy. Fortaleza, Ceará, Brazil, 2025

ID	Assessment instrument	Educational Intervention	Intervention format	Classification of the intervention	Evaluated outcomes (conhecimento, habilidade, atitude)	Main findings
E1	Questionnaires + HbA1c	Text message via phone	Individual	Light-hard technology	Knowledge + skills	↓HbA1c, ↑knowledge, ↑injection skills
E2	Structured interview + HbA1c	Interview	Individual	Light technology	Attitude + adherence	↓HbA1c, ↑adherence
E3	Interactive DVD + pré/pós-teste	Interactive DVD	Group	Light-hard technology	Knowledge + attitude	↑knowledge, ↑acceptance
E4	Questionnaires, HbA1c, creatinine	Electronic game	Group	Light-hard technology	Knowledge + skills	↓HbA1c, ↑knowledge, ↑skill
E5	Flipchart validation	Multimedia program (video tapes)	Group	Light-hard technology	Attitude	↑acceptance
E6	Flipchart validation	Flipchart	Group	Light-hard technology	Attitude	↑acceptance
E7	Plataforma online + HbA1c	Flipchart	Group	Light-hard technology	Knowledge + adherence	↓HbA1c, ↑adherence
E8	Video vs. printed material + HbA1c	Health education and online insulin game	Group	Light-hard technology	Knowledge + skills	↑knowledge, ↑skill
E9	Habit monitoring + HbA1c	Educational video	Group	Light-hard technology	Skill	↓HbA1c, ↑injection technique
E10	Remote monitoring + HbA1c	Intensive courses and intensive telephone calls	Individual	Light-hard technology	Adherence	↓HbA1c, ↑adherence
E11	Multimedia + HbA1c	Remote intervention (video calls)	Group	Light-hard technology	Skill + attitude	↓HbA1c, ↑skill, ↑acceptance
E12	Quasi-experimental + adherence	Multimedia education	Group	Light-hard technology	Skill + adherence	↑adherence, ↑technique
E13	Nursing project + observation	Educational program	Group	Light-hard technology	Skill	↑self-injection accuracy
E14	Comprehensive education + HbA1c	Nursing project	Group	Light-hard technology	Knowledge + adherence	↓HbA1c, ↑adherence
E15	Practical assessment of technique	Nursing consultation with an emphasis on health education	Group	Light-hard technology	Skill + adherence	↑adherence, ↑technique
E16	Educational video validation	Forum-based group education on injection technique	Group	Light-hard technology	Attitude	↑acceptance

Soft technologies do not depend on specific equipment or physical devices, but rather on interpersonal skills, communication, and the professional's capacity for empathy and engagement.^[15] Thus, one study identified the use of an interview tool to address psychological resistance among diabetic patients toward insulin use as a soft technology. This approach helped patients feel more comfortable with introducing insulin into their treatment, thereby promoting greater adherence and improving glycemic control.^[17]

Care practices for individuals with chronic noncommunicable diseases can be strengthened through empathetic and welcoming relationships, particularly in the actions of health-care professionals who promote person-centered care.^[15] By adopting soft technologies and effective communication, professionals extend care beyond prescriptive measures, creating opportunities for a more humanized and transformative approach to health promotion—one that values subjectivity and strengthens therapeutic relationships within the care environment.^[15]

Soft-hard technologies, in turn, require a structured body of knowledge, such as nursing, medicine, and other health sciences, and operate at the interface between human relationships and the application of specific techniques.^[15] In this context, several studies incorporated elements characteristic of soft-hard technologies, while also integrating aspects of soft technologies due to the ongoing and personalized follow-up of patients.^[16, 19, 30]

Using text messages to educate patients on insulin administration promoted continuous communication, provided regular support, and engaged participants in learning about diabetes management.^[15] Similarly, an educational program focused on insulin pen use included follow-up sessions to monitor patient progress and provide immediate feedback, strengthening self-confidence and understanding of correct administration techniques.^[19]

Additionally, a study conducted in India evaluated insulin injection practices and, after six months, observed that initiatives aimed at re-educating patients and caregivers on proper insulin injection techniques—including correct device use and application methods—positively influenced knowledge and treatment adherence. This suggests that such interventions are a crucial support mechanism for successful diabetes education.^[30]

When analyzing the mapped evidence, no purely physical technology was identified. However, considering that some interventions depend on physical or digital materials, there is an intersection between semi-physical and hard technologies. This overlap is well illustrated by studies that combined ad-

vanced monitoring technologies with educational protocols, offering an integrated approach to glycemic control. Continuous glucose monitoring interventions, for example, have been used to help adult patients with type 1 diabetes achieve remote glycemic control.^[25, 27]

Similarly, other studies explored training patients to use the Automated Insulin Delivery (AID) system—a technology that integrates continuous glucose monitoring with automated insulin administration. This system adjusts insulin doses in response to glucose levels, allowing for more precise and adaptive disease management.^[27]

In addition, educational videos and printed booklets combine scientific knowledge dissemination with enhanced patient learning, offering simple, continuous learning opportunities. Healthcare professionals often employ these strategies throughout the management and care process.^[20, 21, 31, 34] These technologies are adaptable across contexts, making them more inclusive and feasible to implement.^[35, 36]

This review illustrates educational interventions for insulin therapy at the intersection of soft-hard and hard technologies, showing how advanced monitoring technologies, when combined with a solid educational foundation, can improve health outcomes in insulin therapy and diabetes management. Integrating these types of technologies enables a balance between device use and the development of the knowledge and skills necessary for self-care, promoting closer and more accurate patient monitoring that yields broad health benefits.

The findings of this review may assist healthcare professionals and researchers by mapping and synthesizing educational interventions for insulin therapy education. These findings can support selecting the most appropriate types of interventions for diabetes education, thereby expanding the use of these tools. Moreover, the results of this study may inform future research, as new studies can be developed to explore other types of educational interventions, especially those mediated by educational technologies that have not yet been reported in the literature.

As a study limitation, excluding articles without full-text availability may have limited the inclusion of other relevant evidence on the use of educational technologies in promoting the health of adults undergoing insulin therapy. Furthermore, because scoping reviews aim to provide a broad overview of the literature, we did not formally assess the included studies' methodological quality or risk of bias.

5. CONCLUSION

The most frequent educational interventions identified in the studies selected in this scoping review for patients on insulin

therapy were interviews, nursing consultations, printed materials, videos, mobile applications, and games. Therefore, the educational technologies (soft and soft-hard) identified in the literature represent essential teaching-learning tools for healthcare professionals to use during care and interventions. They allow patients to build knowledge about their condition and the pharmacological and non-pharmacological care needed during treatment. Further studies are needed to develop, validate, and clinically evaluate other educational interventions, particularly those exploring new types of educational technologies.

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AUTHORS CONTRIBUTIONS

Macêdo TS, Oliveira KGM, Brito OD, Silva AAO, and Cavalcante FML were responsible for the study design, review, and data collection. Macêdo TS, Brito OD, and Cavalcante FML drafted the manuscript, and Pinto CMCB, Caetano JÁ, and Barros LM reviewed it. All authors read and approved the final manuscript.

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CONFLICTS OF INTEREST DISCLOSURE

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

INFORMED CONSENT

Obtained.

ETHICS APPROVAL

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PROVENANCE AND PEER REVIEW

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

DATA SHARING STATEMENT

No additional data are available.

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