

# Knowledge translation technologies for educating child health professionals: a scoping review

Tecnologias de translação do conhecimento para educação de profissionais da saúde da criança: revisão de escopo

Tecnologías de traducción de conocimientos para educar a los profesionales de la salud infantil: una revisión de alcance

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## Abstract

**Objective:** To map scientific evidence on the technological tools that have been used in knowledge translation for the education of professionals in the context of child health.

**Methods:** This is a scoping review. The JBI Manual for Evidence Synthesis recommendations were followed. Primary studies, with no time restrictions, in Portuguese, English, and Spanish were included. The search was conducted across eight databases up to November 2022. Rayyan<sup>®</sup> QCRI software was used for the screening process. Data analysis occurred in three stages: data extraction, thematic categorization, and synthesis.

**Results:** The sample included 14 studies. Canada stood out as the largest publisher of studies in this area. Most of the technologies created were soft-hard and hard, with video being the most produced technology.

**Conclusion:** The video stood out as the primary technology used in the education of healthcare professionals in pediatric settings. We can see the importance of educational technologies in health as promoters of knowledge translation and facilitators in the process of continuing education for healthcare professionals who work in child healthcare.

## Resumo

**Objetivo:** Mapear as evidências científicas sobre as ferramentas tecnológicas que têm sido utilizadas na translação do conhecimento para a educação de profissionais no contexto da saúde da criança.

**Métodos:** Trata-se de uma revisão de escopo. Foram seguidas as recomendações do *Manual for Evidence Synthesis* da JBI. Os critérios de inclusão foram estudos primários, sem um recorte temporal, no idiomas português, inglês e espanhol. A busca ocorreu em oito bases de dados, até novembro de 2022. Utilizou-se o Software Rayyan<sup>®</sup> QCRI para o processo de triagem. A análise ocorreu em três etapas: extração, categorização temática e sintetização dos dados.

**Resultados:** A amostra contou com 14 estudos. O Canadá se destacou como maior publicador de estudos nessa área. A maioria das tecnologias criadas foram leve-dura e duras, sendo o vídeo a tecnologia mais produzida.

**Conclusão:** O vídeo se destacou-se como a principal tecnologia empregada na educação de profissionais no contexto pediátrico. Nota-se a importância das Tecnologias Educacionais em Saúde como promotoras da Translação do Conhecimento e facilitadoras no processo de educação permanente dos profissionais de saúde que atuam no cuidado à saúde da criança.

## Resumen

**Objetivo:** Mapear la evidencia científica sobre las herramientas tecnológicas que se han utilizado en la traducción del conocimiento para la formación de profesionales en el contexto de la salud infantil.

**Métodos:** Se trata de una revisión de alcance. Se siguieron las recomendaciones del *Manual for Evidence Synthesis* del JBI. Los criterios de inclusión fueron estudios primarios, sin límite temporal, en idiomas portugués, inglés y español. La búsqueda se realizó en ocho bases de datos hasta noviembre de 2022. Se utilizó el software Rayyan<sup>®</sup> QCRI para el proceso de selección. El análisis se desarrolló en tres etapas: extracción, categorización temática y síntesis de datos.

**Resultados:** La muestra estuvo compuesta por 14 estudios. Canadá destacó como el mayor editor de estudios en esta área. La mayoría de las tecnologías creadas fueron soft-hard y hard, siendo el vídeo la tecnología más producida.

## Keywords

Pediatric nursing; Educational technology; Translational science biomedical; Child Health; Health personnel; Education continuing

## Descritores

Enfermagem pediátrica; Tecnologia educacional; Ciência translacional biomédica; Saúde da criança; Pessoal de saúde; Educação continuada.

## Descriptoros

Enfermería pediátrica; Tecnología educacional; Ciencia traslacional biomédica; Salud infantil; Personal de salud; Educación continua

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**Conclusión:** El video se destacó como la principal tecnología empleada en la formación de profesionales en el ámbito pediátrico. Se constata la importancia de las Tecnologías Educativas en Salud como promotoras de la Traducción del Conocimiento y facilitadoras en el proceso de formación continuada de los profesionales sanitarios que trabajan en la atención a la salud infantil.

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## Introduction

With technical-scientific advances, educational technologies have entered health spaces and are known as educational technologies in health (ETH), which are tools created from collective construction and scientific knowledge that enable strengthening the teaching-learning process among those involved, standing out as instruments that facilitate professionals' work process in health education practice.<sup>(1)</sup>

ETH can be classified as: soft, which are focused on interpersonal relationships (e.g., health education); soft-hard, aimed at structuring knowledge and work processes involved (e.g., clinical protocols); and hard, related to instruments, equipment/technological devices (e.g., devices/equipment).<sup>(2)</sup> Thus, some examples of educational technologies produced for the health area are videos, leaflets, applications, games, software, manuals, booklets, among others.<sup>(3)</sup>

ETH have been used in various health fields, including child health, with the aim of promoting the training and continuing education of professionals who provide care to children, as provided for in the Brazilian National Policy for Comprehensive Child Healthcare (In Portuguese, *Política Nacional de Atenção Integral à Saúde da Criança - PNAISC*).<sup>(4)</sup> A scoping review that investigated the use of ETH in pediatric oncology observed the importance of inserting these technological tools as facilitators in health education practice, providing increased knowledge of professionals on topics involving pediatric oncology.<sup>(3)</sup>

Health research has become increasingly concerned with the applicability of results in practice. This movement of changing the focus of researchers to transform health knowledge into evidence that can be used in clinical care is called knowledge translation (KT).<sup>(5)</sup>

KT consists of a dynamic process that aims to translate knowledge produced in research spaces and adapt it to reality, reducing the gap between theory and practice, academia and assistance<sup>(6)</sup> and optimiz-

ing the quality of care provided through better use of scientific evidence.<sup>(7)</sup>

The expanded concept of KT aims at knowledge creation, exchange, and dissemination; and to this end, the use of technologies has helped in this process.<sup>(8)</sup> Given this context, this study is justified due to the importance of investigating the types of technological KT tools that have been developed for healthcare professionals. Thus, this study aimed to map scientific evidence on the technological tools that have been used in KT for the education of professionals in the context of child health.

## Methods

This is a scoping review, developed in strict accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) quality criteria,<sup>(9)</sup> with its protocol attached to the Open Science Framework (OSF) Platform, under the wrbqg registry, available at <https://osf.io/wrbqg/>.

During the construction of this study, the following stages recommended by the JBI Manual for Evidence Synthesis were followed: elaboration of research objective and question; delimitation of a search strategy for data selection and gathering; search, selection, and analysis of the information found in the databases; and synthesis and arrangement of results.<sup>(9)</sup>

For the data search and selection stage, the following research question was used: What technological tools have been used in KT for healthcare professionals regarding child health? For its elaboration, the mnemonic Population, Concept and Context (PCC) was used, meaning: P - necessarily healthcare professionals, and may include studies involving professionals and other guardians; C - KT technological tools, with any and all technological or organizational devices that contribute to healthcare and education being considered as tools<sup>(10)</sup>; and C - aimed at child

health, considering the definition of child by the Child and Adolescent Statute (In Portuguese, *Estatuto da Criança e do Adolescente - ECA*),<sup>(11)</sup> i.e., any person up to 12 years of age.

Regarding eligibility criteria, primary studies of a descriptive, exploratory and technological nature, aimed at KT for healthcare professionals, were included. Moreover, a time frame was not defined, as the aim was to carry out a broader mapping, with the completion period being November 2022. Concerning language, studies that were in Portuguese, English and Spanish were chosen. Studies of expert opinions, such as editorials, those that were not available in full or simple and expanded abstracts published in conferences were excluded.

The search took place in the following databases: Excerpta Medica Database (EMBASE); Cochrane Library; National Center for Biotechnology Information PubMed (PubMed); Latin American and Caribbean Literature in Health Sciences (LILACS); Nursing Database (BDENF); Cumulative Index to Nursing and Allied Health Literature (CINAHL); Scopus; Web of Science; and the online library Scientific Electronic Library Online (SciELO). The selected descriptors were taken from the database (Medical Subject Headings (MeSH) and Health Sciences Descriptors (DeCS)) according to the research focus. In addition, the descriptors were used with the Boolean operators AND and OR, according to the search strategy developed in Chart 1. It is worth mentioning that the search was carried out by a librarian with expertise in the health area, linked to the Health Sciences Center (HSC) Sector Library of the Health Sciences Center – Medicine – (In Portuguese, *Biblioteca Setorial do Centro de Ciências da Saúde – Medicina - BSCCSM*) of a federal university in southern Brazil.

The selection of articles that comprised this study was divided into two stages. In the first, the title and abstract were read by two reviewers, blinded during this process, using the online tool Rayyan® (2022, Qatar Foundation, Qatar), using the eligibility criteria. In case of disagreement regarding the inclusion or exclusion of an article, a third reviewer participated as a judge in this decision-making. Reference managers were not used. Once in possession of pre-selected articles, the two reviewers read the studies in full, as occurred in the first stage. In case of disagreement in

the decision-making process, a third reviewer decided whether the article would be included or excluded. After the final study selection, the data were analyzed in three stages. In the first stage, the extraction and organization in a structured spreadsheet was carried out, using a collection instrument with three axes: 1. Descriptive data (author, year, country, and objective); 2. Methodological data (study design, child health area, target audience, and type of technological tool); and 3. Results and conclusions (main findings and implications). In the second stage, thematic categorization was carried out, in which the data were grouped by similarity (e.g., types of technologies, KT strategies, and target audiences), combining descriptive analysis (frequency, geographic distribution, and predominant methods) with critical interpretation (identification of gaps and trends). Finally, the results were synthesized into a coherent narrative, aligned with the research question, highlighting patterns and divergences in literature.

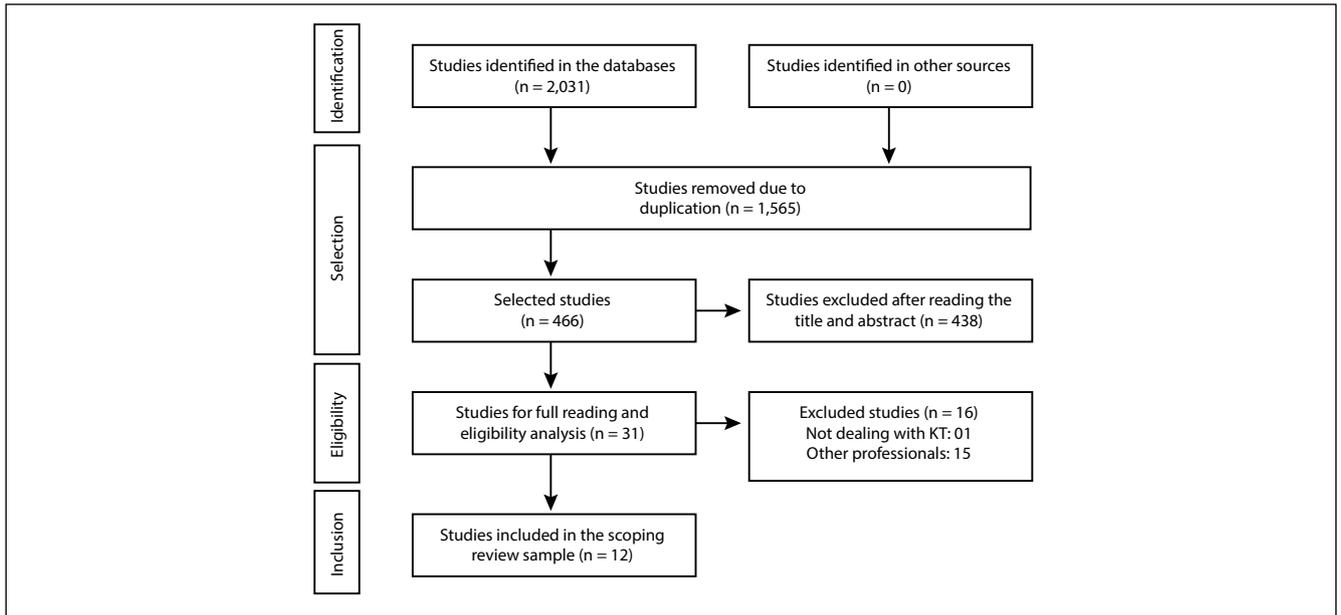
## Results

A total of 2,031 studies were found in the databases. From the first assessment, 1,565 studies were removed due to duplication, resulting in 466 for reading the titles and abstracts. Thus, 28 studies that were related to the research question and the research objective were selected, excluding 438 that were not suitable. The next stage was in which the texts were read in full and the eligibility criteria were applied. Of the 28 studies, 16 were excluded, resulting in a total of 12 articles included for analysis (Figure 1).

In relation to the year of publication of the studies, the most prevalent years were 2017 and 2019, with a total of two studies in each year (16.66%). It was observed that the majority of studies were published in the last five years, from 2017 to 2022, corresponding to 66.7% of eligible studies. Regarding the place of publication, the country that published the most studies was Canada (75%), followed by Brazil (16.7%) and the United States of America (USA) (8.3%). As for the child health area, most studies were focused on pediatrics (58.4%), followed by neonatology (33.3%) and both areas (8.3%). In relation to the technology type developed, there are virtual reality<sup>(13)</sup> (8.33%), guidelines

**Chart 1.** Search strategies used in the selected databases

Database	Search strategy
Embase	("Knowledge Translation" OR "Knowledge Translations") AND ("Educational Technology" OR "Educational Technologies" OR "Instructional Technology" OR "Instructional Technologies" OR "Teaching Materials" OR "Teaching Material" OR "Audiovisual Aids" OR "Audiovisual Aid" OR "Audio-Visual Aids" OR "Audio Visual Aids" OR "Audio-Visual Aid" OR "Visual Aids" OR "Visual Aid" OR "videos" OR "Video" OR "Booklets" OR "booklet" OR "Animation" OR "Games" OR "Game" OR "Application" OR "Applications" OR "apps" OR "comics" OR "Song" OR "songs" OR "Tool" OR "Tools" OR "Technologies" OR "Technology" OR "Instruments") AND ("child" OR "children" OR "childhood" OR "preschool" OR "preschools" OR "infancy" OR "infant" OR "infants" OR "Pediatrics")
Cochrane Library	("Knowledge Translation" OR "Knowledge Translations") AND ("Educational Technology" OR "Educational Technologies" OR "Instructional Technology" OR "Instructional Technologies" OR "Teaching Materials" OR "Teaching Material" OR "Audiovisual Aids" OR "Audiovisual Aid" OR "Audio-Visual Aids" OR "Audio Visual Aids" OR "Audio-Visual Aid" OR "Visual Aids" OR "Visual Aid" OR "videos" OR "Video" OR "Booklets" OR "booklet" OR "Animation" OR "Games" OR "Game" OR "Application" OR "Applications" OR "apps" OR "comics" OR "Song" OR "songs" OR "Tool" OR "Tools" OR "Technologies" OR "Technology" OR "Instruments") AND ("child" OR "children" OR "childhood" OR "preschool" OR "preschools" OR "infancy" OR "infant" OR "infants" OR "Pediatrics")
PubMed	("Knowledge Translation" OR "Knowledge Translations") AND ("Educational Technology"[Mesh] OR "Educational Technology" OR "Educational Technologies" OR "Instructional Technology" OR "Instructional Technologies" OR "Teaching Materials" OR "Teaching Materials"[Mesh] OR "Teaching Material" OR "Audiovisual Aids"[Mesh] OR "Audiovisual Aids" OR "Audiovisual Aid" OR "Audio-Visual Aids" OR "Audio Visual Aids" OR "Audio-Visual Aid" OR "Visual Aids" OR "Visual Aid" OR "videos" OR "Video" OR "Booklets" OR "booklet" OR "Animation" OR "Games" OR "Game" OR "Application" OR "Applications" OR "apps" OR "comics" OR "Song" OR "songs" OR "Tool" OR "Tools" OR "Technologies" OR "Technology" OR "Instruments") AND ("Child"[Mesh] OR "child" OR "children" OR "childhood" OR "Child, Preschool"[Mesh] OR "preschool" OR "preschools" OR "infancy" OR "Infant"[Mesh] OR "infant" OR "infants" OR "Pediatrics"[Mesh] OR "Pediatrics")
LILACS and BDNF	("Knowledge Translation" OR "Knowledge Translations" OR "Tradução de Conhecimento" OR "Tradução do Conhecimento" OR "Traslación de Conhecimento" OR "Traslación do Conhecimento" OR "investigación traslacional" OR "traslación de conocimientos") AND ("Educational Technology" OR "Educational Technologies" OR "Instructional Technology" OR "Instructional Technologies" OR "Teaching Materials" OR "Teaching Material" OR "Audiovisual Aids" OR "Audiovisual Aid" OR "Audio-Visual Aids" OR "Audio Visual Aids" OR "Audio-Visual Aid" OR "Visual Aids" OR "Visual Aid" OR "videos" OR "Video" OR "Booklets" OR "booklet" OR "Animation" OR "Games" OR "Game" OR "Application" OR "Applications" OR "apps" OR "comics" OR "Song" OR "songs" OR "Tool" OR "Tools" OR "Technologies" OR "Technology" OR "Instruments" OR "Tecnologia Educacional" OR "Tecnología Instrucional" OR "Materiais de Ensino" OR "Materiais Didáticos" OR "Materiais de Estudo" OR "Material Didático" OR "Material de Ensino" OR "Recursos Audiovisuais" OR "Audiovisuais" OR "Audiovisual" OR "Recurso Visual" OR "Recursos Visuais" OR "Recursos de Áudio e Vídeo" OR "Cartilha" OR "Cartilhas" OR "Animação" OR "Jogos" OR "Jogo" OR "Aplicativos" OR "Aplicativo" OR "Quadrinhos" OR "Música" OR "Músicas" OR "tecnología de la formación" OR "tecnología en docência" OR "Materiales de Enseñanza" OR "material de enseñanza" OR "material didáctico" OR "materiales de estudio" OR "materiales didácticos" OR "Recursos Audiovisuales" OR "recursos visuales" OR "Cebador" OR "folletos" OR "Animación" OR "Juegos" OR "Juego" OR "aplicaciones" OR "Solicitud" OR "historietas" OR "Canción" OR "canciones") AND ("child" OR "children" OR "childhood" OR "preschool" OR "preschools" OR "infancy" OR "infant" OR "infants" OR "Pediatrics" OR "Criança" OR "Crianças" OR infanc* OR infant* OR "pré-escolar" OR preescolar* OR "pré-escolares" OR escolar* OR "Pediatria" OR "Niño" OR "Niños")
CINAHL	("Knowledge Translation" OR "Knowledge Translations") AND ("Educational Technology" OR "Educational Technologies" OR "Instructional Technology" OR "Instructional Technologies" OR "Teaching Materials" OR "Teaching Material" OR "Audiovisual Aids" OR "Audiovisual Aid" OR "Audio-Visual Aids" OR "Audio Visual Aids" OR "Audio-Visual Aid" OR "Visual Aids" OR "Visual Aid" OR "videos" OR "Video" OR "Booklets" OR "booklet" OR "Animation" OR "Games" OR "Game" OR "Application" OR "Applications" OR "apps" OR "comics" OR "Song" OR "songs" OR "Tool" OR "Tools" OR "Technologies" OR "Technology" OR "Instruments") AND ("child" OR "children" OR "childhood" OR "preschool" OR "preschools" OR "infancy" OR "infant" OR "infants" OR "Pediatrics")
SciELO	("Knowledge Translation" OR "Knowledge Translations" OR "Tradução de Conhecimento" OR "Tradução do Conhecimento" OR "Traslación de Conhecimento" OR "Traslación do Conhecimento" OR "investigación traslacional" OR "traslación de conocimientos") AND ("Educational Technology" OR "Educational Technologies" OR "Instructional Technology" OR "Instructional Technologies" OR "Teaching Materials" OR "Teaching Material" OR "Audiovisual Aids" OR "Audiovisual Aid" OR "Audio-Visual Aids" OR "Audio Visual Aids" OR "Audio-Visual Aid" OR "Visual Aids" OR "Visual Aid" OR "videos" OR "Video" OR "Booklets" OR "booklet" OR "Animation" OR "Games" OR "Game" OR "Application" OR "Applications" OR "apps" OR "comics" OR "Song" OR "songs" OR "Tool" OR "Tools" OR "Technologies" OR "Technology" OR "Instruments" OR "Tecnologia Educacional" OR "Tecnología Instrucional" OR "Materiais de Ensino" OR "Materiais Didáticos" OR "Materiais de Estudo" OR "Material Didático" OR "Material de Ensino" OR "Recursos Audiovisuais" OR "Audiovisuais" OR "Audiovisual" OR "Recurso Visual" OR "Recursos Visuais" OR "Recursos de Áudio e Vídeo" OR "Cartilha" OR "Cartilhas" OR "Animação" OR "Jogos" OR "Jogo" OR "Aplicativos" OR "Aplicativo" OR "Quadrinhos" OR "Música" OR "Músicas" OR "tecnología de la formación" OR "tecnología en docência" OR "Materiales de Enseñanza" OR "material de enseñanza" OR "material didáctico" OR "materiales de estudio" OR "materiales didácticos" OR "Recursos Audiovisuales" OR "recursos visuales" OR "Cebador" OR "folletos" OR "Animación" OR "Juegos" OR "Juego" OR "aplicaciones" OR "Solicitud" OR "historietas" OR "Canción" OR "canciones") AND ("child" OR "children" OR "childhood" OR "preschool" OR "preschools" OR "infancy" OR "infant" OR "infants" OR "Pediatrics" OR "Criança" OR "Crianças" OR infanc* OR infant* OR "pré-escolar" OR preescolar* OR "pré-escolares" OR escolar* OR "Pediatria" OR "Niño" OR "Niños")
Scopus	("Knowledge Translation" OR "Knowledge Translations") AND ("Educational Technology" OR "Educational Technologies" OR "Instructional Technology" OR "Instructional Technologies" OR "Teaching Materials" OR "Teaching Material" OR "Audiovisual Aids" OR "Audiovisual Aid" OR "Audio-Visual Aids" OR "Audio Visual Aids" OR "Audio-Visual Aid" OR "Visual Aids" OR "Visual Aid" OR "videos" OR "Video" OR "Booklets" OR "booklet" OR "Animation" OR "Games" OR "Game" OR "Application" OR "Applications" OR "apps" OR "comics" OR "Song" OR "songs" OR "Tool" OR "Tools" OR "Technologies" OR "Technology" OR "Instruments") AND ("child" OR "children" OR "childhood" OR "preschool" OR "preschools" OR "infancy" OR "infant" OR "infants" OR "Pediatrics")
Web of Science	("Knowledge Translation" OR "Knowledge Translations") AND ("Educational Technology" OR "Educational Technologies" OR "Instructional Technology" OR "Instructional Technologies" OR "Teaching Materials" OR "Teaching Material" OR "Audiovisual Aids" OR "Audiovisual Aid" OR "Audio-Visual Aids" OR "Audio Visual Aids" OR "Audio-Visual Aid" OR "Visual Aids" OR "Visual Aid" OR "videos" OR "Video" OR "Booklets" OR "booklet" OR "Animation" OR "Games" OR "Game" OR "Application" OR "Applications" OR "apps" OR "comics" OR "Song" OR "songs" OR "Tool" OR "Tools" OR "Technologies" OR "Technology" OR "Instruments") AND ("child" OR "children" OR "childhood" OR "preschool" OR "preschools" OR "infancy" OR "infant" OR "infants" OR "Pediatrics")



KT - knowledge translation

Source: Adapted model of the PRISMA flowchart.<sup>(12)</sup>

**Figure 1.** Flowchart of article selection stages

<sup>(14,15)</sup> (16.66%), pamphlets<sup>(16)</sup> (8.33%), synthesis table<sup>(17)</sup> (8.33%), videos<sup>(16,18-20)</sup> (33.33%), online evidence knowledge base<sup>(21)</sup> (8.33%), virtual coaching<sup>(22)</sup> (8.33%), and applications<sup>(23,24)</sup> (16.66%) (Chart 2). In order to facilitate understanding of results, a chart was prepared with information on study, author and title, year and country, objective, study design and child health area, target audience and type of technological tool, and results/conclusion (Chart 2).

## Discussion

This scoping review contributed to the identification of the main technological and innovation tools aimed at professionals in the child health area, revealing the most varied types of technologies and aimed at different areas of care.

Regarding the development and use of KT technological tools for the education of professionals in the child health area, it is noted that most of the studies have been produced by Canada; this is explained by the fact that this country has been a pioneer in research focused on KT as well as in several theories in this area. In 2000, the country founded the Canadian Institutes of Health Research (CIHR), which aims to create and translate new knowledge in the research

area and to ensure that such knowledge is applicable in practice, optimizing the provision of care and strengthening the health system.<sup>(8)</sup> Since then, KT has been the focus of several studies.

It can be seen that research on KT began to be published more frequently from 2015 onwards, as shown by the results of this study, demonstrating that despite being a topic that has been worked on since 2000, it has gained more space in scientific productions in the last 10 years.<sup>(25)</sup> It is also worth noting that, even though Canada is the precursor of KT, Brazil has stood out for directing research with this focus, contributing to improving the country's visibility in the scientific community that studies KT.<sup>(25)</sup>

The main technologies produced were soft-hard, such as guidelines,<sup>(14,15)</sup> synthesis tables,<sup>(17)</sup> evidence knowledge base,<sup>(21)</sup> pamphlet,<sup>(16)</sup> virtual coaching.<sup>(22)</sup> These technologies are aimed at improving work processes, i.e., they were developed with information that helps professionals in their practical work. The use of soft-hard technologies has grown in nursing practice, given that they enable the construction of knowledge based on reality and existing knowledge, resulting in a technology that offers several possibilities of applicability to professionals.<sup>(26)</sup> The second most prevalent group of technologies were hard, such as videos,<sup>(16,18-20)</sup> applications,<sup>(23,24)</sup> virtual reality.<sup>(13)</sup> Such technologies

**Chart 2.** Characterization of studies included in the scoping review

Author Year Country	Main study topic	Objective	Study design Child health area Target audience Technological tool type	Results/conclusion
Banerjee-Guenette <i>et al.</i> 2019 <sup>(13)</sup> Canada	Adoption of virtual reality in the pediatric context	Assess the impact of a multifaceted KT strategy for the implementation of virtual reality intervention by rehabilitation clinicians in a pediatric hospital setting.	Study design: Mixed methods, pre/post/follow-up Area: Pediatrics Target audience: Healthcare professionals Technology classification: Hard Technology type: Virtual Reality	The use of virtual reality can improve behavior control and the facilitating conditions and barriers in the clinical rehabilitation environment for pediatric patients.
Zanon <i>et al.</i> 2021 <sup>(14)</sup> Brazil	Development and validation of a guideline for communicating HIV diagnosis in children	Create and validate the content of a guideline for monitoring communication of the diagnosis of Human Immunodeficiency Virus (HIV) in childhood.	Study design: Methodological Area: Pediatrics Target audience: Healthcare professionals Technology classification: Soft-hard Technology type: Guideline	The strategy proved to be positive, increasing knowledge and confidence in using technology.
Rourke <i>et al.</i> 2009 <sup>(15)</sup> Canada	Technologies for monitoring child development	Assess the use of the Rourke Baby Record (RBR) and the quality of documentation of well-child visits by family physicians/general practitioners.	Study design: Retrospective Area: Neonatology and pediatrics Target audience: Healthcare professionals Technology classification: Soft-hard Technology type: Guideline	The guideline allows the insertion of technology into the work process. In addition, it allows professionals to consult the material, assisting in decision-making in their care practice.
Taddio <i>et al.</i> 2015 <sup>(16)</sup> Canada	Educational tools for pain management in newborns	Assess the usability and effectiveness of educational tools on pain management during childhood vaccination aimed at postnatal nurses.	Study design: Mixed methods Area: Neonatology Target audience: Healthcare professionals Technology classification: Soft-hard, Hard Technology type: Pamphlet and video	Most professionals who use RBR present better records of care provided to children. Participants stated that RBR is a useful tool for addressing parents' concerns, identifying health problems, as well as situations that present risks to children's health, and assessing child development.
Di Rezze <i>et al.</i> 2013 <sup>(17)</sup> Canada	Disseminating knowledge among professionals	Assess the use of synthesis tables of findings from systematic reviews.	Study design: Qualitative Area: Pediatrics Target audience: Healthcare professionals Technology classification: Soft-hard Technology type: Synthesis tables	The tools allowed nurses to become aware of the importance of pain control in newborns, as well as providing important information to improve their skills in pain management practice.
Almeida <i>et al.</i> 2018 <sup>(18)</sup> Brazil	Pain relief strategies for newborns	Describe the profile of nurses working in hospital units that care for newborns, verify the prior knowledge of these nurses about the use of breastfeeding, skin-to-skin contact and sweetened solutions for relieving neonatal procedural pain, and assess the feasibility, acceptability and usefulness of the video "Be Sweet to Babies" from nurses' perspective.	Study design: Cross-sectional Area: Neonatology Target audience: Healthcare professionals Technology classification: Hard Technology type: Video	The tables proved to be relevant to participants, who reported that they could use some of the interventions from the studies presented in the tables in their future practices, although it was not clear whether professionals were looking for a synthesis table of the studies or a table with scientific evidence to help them in their practice.
Harrison <i>et al.</i> 2017 <sup>(19)</sup> Canada	Pain relief strategies for newborns	Assess the reach and acceptability of the video "Be Sweet to Babies" posted on YouTube®.	Study design: Cohort Area: Neonatology Target audience: Healthcare professionals and caregivers Technology classification: Hard Technology type: Video	Most professionals already used the techniques presented for pain relief, but stated that they intended to use one or more of these techniques in their future practice. Moreover, there was consensus in recommending the video to other professionals.
King <i>et al.</i> 2014 <sup>(20)</sup> Canada	Improving effective listening and interpersonal communication	Describe the creation and validation of six simulations related to effective listening and interpersonal communication in pediatric rehabilitation.	Study design: Qualitative - Focus groups Area: Pediatrics Target audience: Healthcare professionals Technology classification: Hard Technology type: Digital simulation videos	The video proved to be a useful resource, with an adequate duration and easy to understand, allowing the knowledge to be applied in practical situations. In addition, participants stated that they would recommend the video to other people.

Continue...

Continuation.

Author Year Country	Main study topic	Objective	Study design Child health area Target audience Technological tool type	Results/conclusion
Featherstone <i>et al.</i> 2017 <sup>(21)</sup> Canada	Disseminating knowledge among professionals	Describe methods for developing and disseminating a knowledge base of evidence in PEM for Translating Emergency Knowledge for Kids (TREKK).	Study design: Methodological Area: Pediatrics Target audience: Healthcare professionals Technology classification: Soft-hard Technology type: Online evidence-based knowledge base	The simulations in the videos aimed to allow professionals to refine their behavior and posture in the management of a pediatric rehabilitation clinic. The construction in co-participation with end users allowed the videos to focus on practical applicability. Furthermore, the videos brought an approach with different levels of complexity, favoring the development of skills such as listening and communication.
Kobulsky <i>et al.</i> 2019 <sup>(22)</sup> United States of America (USA)	Improving professional competence	Examine the association between receipt of virtual coaching and curriculum completion, perceived adoption of mental health competency and satisfaction with training, and perceived effect on practice behaviors.	Study design: Pilot - Experimental method Area: Pediatrics Target audience: Healthcare professionals Technology classification: Soft-hard Technology type: Virtual coaching	The evidence base was constructed with 22 pyramids, each corresponding to a health condition found in PEM, and for each of these pyramids, 13 final recommendations for intervention procedures were provided.
Chun <i>et al.</i> 2022 <sup>(23)</sup> Canada	Disseminating knowledge among professionals	Determine the effectiveness of Twitter as a KT dissemination method in Pediatric Emergency Medicine (PEM) to increase awareness of the HEARTSMAP tool.	Study design: Prospective promotion Area: Pediatrics Target audience: Healthcare professionals Technology classification: Hard Technology type: App	After testing with 35 users, it was observed that 91% reported that they would use the tool in their work in PEM.
LaRusso <i>et al.</i> 2020 <sup>(24)</sup> Canada	Disseminating knowledge among professionals	Develop a mobile smartphone application to increase utilization of collaborative clinical practice guidelines and promote KT about Canadian congenital diaphragmatic hernia (CDH).	Study design: Methodological Area: Neonatology Target audience: Healthcare professionals Technology classification: Hard Technology type: Application	Participants who underwent virtual coaching were more successful in completing the course, performing better in the training in their practice. In addition, they showed an increase in knowledge of mental health competencies. This suggests that virtual coaching can be a complement to other training courses carried out for child well-being.

aim to provide specific knowledge about children’s health, through technological instruments, generally associated with a high degree of technology involved in their development.<sup>(27)</sup>

In an integrative review study that sought to identify the ETH used in health education in literature, it was observed that the majority were soft-hard and hard,<sup>(27)</sup> supporting the results found in this study. It has been demonstrated, in turn, that regardless of the type of technologies used, they are increasingly being incorporated into health practice, facilitating the health education process and enabling the implementation of KT.

Furthermore, the use of soft-hard and hard technologies has stood out as a strategic tool that enables better reception and longitudinality of the care provided, whether in management or care practice spaces.<sup>(20)</sup>

In this way, ETH have contributed not only to the educational process, but also to comprehensive healthcare as they strengthen health practices.

Among the ETH found in this study, videos are highlighted as the most prevalent. Videos are presented as a low-cost technological tool, attractive to the public, easy to access and provide knowledge objectively, being capable of generating critical reflection on the content conveyed and changing behavior.<sup>(28)</sup> Thus, videos have been an important technology that makes relevant content available directly through audiovisual resources, contributing to professionals’ teaching-learning process.

Another group of technologies, also frequently used in this study, were advisory material technologies, which include guidelines, synthesis tables, evidence knowledge bases and pamphlets. In general,

these technologies aim to gather up-to-date information on a given topic and transform it into knowledge that is more accessible to professionals, facilitating decision-making in clinical practice and contributing to the occurrence of KT.<sup>(14)</sup>

Applications, in turn, are part of a group of technologies known as social media, which consist of a set of websites and applications where content is generated and shared.<sup>(24)</sup> Existing applications such as Twitter®, since its creation in 2006, have been a powerful tool in the dissemination of content and have maximized the discussion of health knowledge by professionals in these spaces.<sup>(29)</sup> However, there are applications created according to specific needs, such as the PICCPED® mobile application (2021, Brazil), which was developed to prevent adverse events in peripherally inserted central catheters in pediatrics, and has been a tool that helps in the dissemination of this knowledge and in decision-making by professionals.<sup>(30)</sup>

Some technologies such as virtual coaching and virtual reality were not prevalent in this study, but are relevant within the context of ETH aimed at KT in the child health area.

Virtual coaching consists of online training in which expert professionals (professors) help other professionals (students) to better connect with knowledge and practice, through frequent and student-centered interaction.<sup>(19)</sup> In a study carried out with pediatric surgery interns in which two study methods were compared, video coaching and textbooks, it was observed that there was a greater number of correct answers among those who used video coaching, making it a good complementary tool in teaching pediatric surgery.<sup>(31)</sup> Thus, although coaching in the health area is not a very frequent practice, it has stood out as an ally in the educational process.

Virtual reality is characterized as computer programs that recreate an interactive simulation environment, enabling users to experience a three-dimensional virtual environment using simulated images, sounds, and movements.<sup>(13,32)</sup> In a cross-sectional observational study carried out in the USA with medical interns, virtual reality was observed for teaching pediatric echocardiography, proving to be a safe and practical device that contributes positively to the learning experience of these professionals.<sup>(32)</sup>

The results of this study will contribute to the discussion of KT within health training spaces, through the use of different ETH, encouraging the development of new research in the area. In addition, it will highlight the role of nursing as a producer of knowledge focused on KT and ETH.

It is worth noting that this scoping review did not include other ETH, such as assistance protocols and bundles, which is therefore a study limitation. Therefore, it is suggested that new studies include a broader search strategy to cover all other ETH available in literature.

## Conclusion

In this study, it was identified that video stood out as the main technology used in the education of professionals in the context of children, due to its effectiveness and clarity in addressing relevant topics. Furthermore, it is worth mentioning that Brazil was the second country in terms of KT production, indicating a significant effort in the dissemination of discoveries and research carried out. It is noted that regardless of the technology, soft, soft-hard and hard, ETH are increasingly being developed by healthcare professionals with the objective of assisting in the teaching-learning process, favoring KT. Thus, technological tools built from reality, through collaborative construction, have favored the dissemination of knowledge more effectively.

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