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REVIEW ARTICLE

Learning to Live Better: Educational Technologies in the Care of Liver Transplant Recipients

Nataly Mieko Nakano[1], Isabella Bedinelo Ferreira[1], Cristina Maria Galvão[1], Karina Dal Sasso Mendes[1,*]

1.Universidade de São Paulo – Escola de Enfermagem – Ribeirão Preto (SP) – Brazil.

*Corresponding author: dalsasso@eerp.usp.br

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ABSTRACT

Objective: To analyze the available evidence in the literature on educational technologies directed at liver transplant recipients. **Method:** An integrative literature review conducted in six stages, incorporating the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses, with prior registration of the protocol in the Open Science Framework. The search for primary studies was carried out in the Scopus, PubMed, CINAHL, Web of Science Core Collection, Embase and LILACS databases, with no restriction on year of publication. Methodological quality was appraised using the tool based on the Johns Hopkins Nursing Evidence-Based Practice model. **Results:** 14 studies were included, with varied methodological designs, comprising randomized and non-randomized clinical trials, qualitative, cohort, cross-sectional, prospective observational, quasi-experimental and methodological studies. The educational technologies identified included mobile applications, booklets, multidisciplinary electronic teaching tools, social media, digital platforms, text message programs, mentoring, multidisciplinary educational programs, knowledge-assessment questionnaires and educational videos delivered through tablets. These technologies proved relevant in supporting teaching, treatment follow-up and social support for recipients, promoting medication adherence, symptom monitoring and access to information about transplantation and postoperative care. **Conclusion:** The evidence reinforces the role of educational technologies in the care of liver transplant recipients, providing support for education, monitoring and social support. The scarcity of national studies highlights the need for further research adapting these technologies to the needs of the Brazilian population.

Descriptors: Liver Transplantation; Transplant Recipients; Educational Technology; Health Education; Perioperative Nursing.

Aprender para Viver Melhor: Tecnologias Educativas no Cuidado a Receptores de Transplante de Fígado

RESUMO

Objetivo: Analisar as evidências disponíveis na literatura sobre as tecnologias educativas direcionadas a receptores de transplante de fígado. **Método:** Revisão integrativa da literatura conduzida em seis etapas, com incorporação das recomendações do *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) e registro prévio do protocolo no *Open Science Framework*. A busca por estudos primários foi realizada nas bases *Scopus, PubMed, Cumulative Index to Nursing and Allied Health Literature* (CINAHL), *Web of Science Core Collection*, *Embase* e Literatura Latino-Americana e do Caribe em Ciências da Saúde (LILACS), sem restrição de ano de publicação. A qualidade metodológica foi avaliada pela ferramenta do modelo *Johns Hopkins Nursing Evidence-Based Practice.* **Resultados:** Foram incluídos 14 estudos, com desenhos metodológicos variados, incluindo ensaios clínicos randomizados e não randomizados, estudos qualitativos, de coorte, transversais, observacionais prospectivos, quase-experimentais e metodológicos. Entre as tecnologias educativas identificadas, destacaram-se aplicativos móveis, cartilhas, ferramentas eletrônicas de ensino multidisciplinar, mídias sociais, plataformas digitais, programas de mensagens de texto, mentoria, programas educativos multidisciplinares, questionários de avaliação do conhecimento e vídeos educativos com uso de *tablets*. Essas tecnologias mostraram-se relevantes no apoio ao ensino, no acompanhamento do tratamento e no suporte social aos receptores, promovendo adesão ao tratamento medicamentoso, monitoramento de sintomas e acesso a informações sobre o transplante e o cuidado pós-operatório. **Conclusão:** As evidências reforçam o papel das tecnologias educativas no cuidado aos receptores de transplante de fígado, oferecendo suporte à educação, ao monitoramento e ao apoio social. A escassez de estudos nacionais evidencia a necessidade de novas investigações que adaptem essas tecnologias às demandas da população brasileira.

Descritores: Transplante de Fígado; Transplantados; Tecnologia Educacional; Educação em Saúde; Enfermagem Perioperatória.

INTRODUCTION

Liver transplantation is recognized worldwide as an essential and effective therapeutic modality, often serving as the only treatment option for patients with end-stage liver disease. This complex intervention has seen significant advances in recent decades, reflecting improvements in organ allocation criteria, surgical techniques, immunosuppressive management, and perioperative care[1,2]. Despite these advances, the demand for transplants continues to exceed organ availability, resulting in long waiting lists and high mortality rates in many countries[3]. In Brazil, continuous monitoring of transplant activity reveals both the expansion in the number of procedures and regional inequalities in the provision of care[4].

The introduction of the Model for End-Stage Liver Disease as a prioritization criterion for liver transplantation represented a significant advancement, directly impacting the equity of organ allocation and reducing waitlist mortality[5,6]. However, the success of the transplant is not limited to the surgical procedure itself but depends on managing the complexities associated with the treatment, including immunosuppression and the risk of rejection[7]. In this context, health education has been identified as an essential tool for empowering patients in self-care, yielding positive results regarding treatment adherence and the prevention of complications[8,9].

Although the importance of health education is widely recognized, gaps persist in the systematic use of educational technologies to prepare and support liver transplant recipients throughout their treatment[10]. There is a lack of studies that integrate and critically analyze available technologies, including educational materials, digital resources, and innovative strategies that facilitate learning and promote patient autonomy[11].

The use of educational technologies can transform the teaching-learning experience in liver transplantation, making knowledge more accessible and effective for patients and their families[12]. Furthermore, these technologies strengthen the work of the healthcare team, particularly nurses, who play a central role in education and continuous care[13]. In light of this, this study seeks to fill existing gaps by synthesizing evidence on the use of educational technologies, contributing to better outcomes regarding the care and quality of life of liver transplant recipients, as well as to the training of transplant teams and the strengthening of evidence-based practice.

Thus, the objective of this study was to analyze the evidence available in the literature regarding educational technologies aimed at liver transplant recipients.

METHODS

This is an integrative literature review, a method that allows for the synthesis of studies with different designs and the incorporation of evidence into clinical practice[14,15]. The process followed six stages: identification of the topic and formulation of the research question; literature search; data collection; critical appraisal of the included studies; interpretation of results; and presentation of the knowledge synthesis. To ensure greater rigour and transparency in reporting, the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)[16] were incorporated. The protocol was previously registered in the Open Science Framework repository[17].

The research question was structured based on the acronym PICo (Population, Phenomenon of interest and Context): "What evidence is available in the literature on educational technologies aimed at liver transplant recipients?".

Eligibility criteria

Primary studies addressing the use of educational technologies for liver transplant recipients, published in English, Portuguese, or Spanish, were included, with no restrictions regarding the year of publication. Case reports, case series, editorials, letters to the editor, conference abstracts, and gray literature were excluded.

Information sources and search strategy

The search was conducted on November 27, 2022, in the following databases: PubMed (National Library of Medicine), Cumulative Index to Nursing and Allied Health Literature (CINAHL), Embase (Elsevier), Scopus (Elsevier), Web of Science Core Collection (Clarivate Analytics), and *Literatura Latino-Americana e do Caribe em Ciências da Saúde* (LILACS). Additionally, a manual search was carried out in the reference lists of the included studies.

The search strategies were constructed based on the PICo acronym and key controlled vocabularies —*Medical Subject Headings* (MeSH), *Descritores em Ciências da Saúde* (DeCS), CINAHL Headings and Emtree—combining the descriptors using the Boolean operators AND and OR and adapting them to the specificities of each database. The complete strategy, including all terms and adaptations for each of the six databases, is available in the registered protocol[17]. By way of example, Table 1 presents the strategy used in the PubMed database.

Table 1. Search strategy used in the PubMed database (example).

Database	Search strategy
PubMed	(("Liver Transplantation"[Mesh] OR "Liver Transplantation" OR "Liver Grafting" OR "Liver Transplantations" OR "Liver Transplant" OR "Liver Transplants" OR "Hepatic Transplantation" OR "Hepatic Transplantations" OR "Liver Recipient" OR "Liver Recipients")) AND (("Patient Education as Topic"[Mesh] OR "Patient Education" OR "Education of Patients" OR "Patient Education Handout" OR "Educational Technology"[Mesh] OR "Educational Technology" OR "Instructional Technology" OR "Teaching Materials"[Mesh] OR "Health Literacy"[Mesh] OR "Consumer Health Information"[Mesh] OR "Health Education"[Mesh] OR "Community Health Education")) AND (("Mobile Applications"[Mesh] OR "Mobile Application" OR "Instructional Film and Video" OR "Video-Audio Media" OR "Audiovisual Aids"[Mesh] OR "Webcasts as Topic"[Mesh] OR "Blogging"[Mesh] OR "Pamphlets"[Mesh] OR "Booklet" OR "Brochure" OR "Cell Phone"[Mesh] OR "Mobile Phone" OR "Computer-Assisted Instruction"[Mesh] OR "Education, Distance"[Mesh] OR "Online Learning" OR "e-book" OR "Electronic Mail"[Mesh] OR "Facebook" OR "Folder" OR "Self-Help Groups"[Mesh] OR "Support Groups" OR "Resource Guide" OR "Graphic Novel" OR "Instagram" OR "Internet"[Mesh] OR "Patient Portals"[Mesh] OR "Play and Playthings"[Mesh] OR "Books"[Mesh] OR "Podcast" OR "Radio"[Mesh] OR "Virtual Reality"[Mesh] OR "Online Social Networking"[Mesh] OR "Social Media"[Mesh] OR "Simulation Training"[Mesh] OR "Computer Communication Networks"[Mesh] OR "Skype" OR "Smartphone"[Mesh] OR "Software"[Mesh] OR "Computers, Handheld"[Mesh] OR "Tablet" OR "Television"[Mesh] OR "WhatsApp" OR "Wiki"))

Note: The complete search strategies for the six databases are available in the registered protocol[17]. Source: Elaborated by the authors.

Selection process

The results were exported to the EndNote X7 reference manager, where duplicates were removed according to the method proposed by Bramer et al.[18]. Study selection was conducted using the Rayyan[19] application, by two reviewers independently and in a blinded manner. Conflicts were resolved by consensus or, when necessary, by a third reviewer.

Data extraction

Data were extracted by two reviewers using a standardized form containing information on authors, title, year of publication, journal, objectives, sample characteristics, post-transplant phase, methodological design, intervention, main results, and conclusions. The data were organized into summary tables to facilitate the analysis and documentation of the findings.

Methodological quality assessment

Methodological quality was assessed using the Research Evidence Appraisal Tool, based on the Johns Hopkins Nursing Evidence-Based Practice model, which categorizes studies into three levels of evidence: Level I (randomized controlled trials or systematic reviews of randomized trials); Level II (quasi-experimental studies or their systematic reviews); and Level III (non-experimental studies, qualitative studies, or their systematic reviews). Following the determination of the level, the quality of the evidence was classified as high (A), good (B), or low (C)[20,21].

Data analysis and synthesis

The results were analyzed descriptively, highlighting the types of educational technologies, key findings, and identified trends. Summary tables were used to organize and present the data, revealing patterns, gaps, and opportunities for future research[22].

RESULTS

Database searches yielded 731 records, distributed as follows: 131 in PubMed, 114 in CINAHL, 17 in LILACS, 317 in Scopus, 96 in the Web of Science Core Collection (WoS), and 56 in Embase. After removing 152 duplicates, 579 studies remained for title and abstract screening. Of these, 556 were excluded, resulting in 23 studies for full-text reading. Out of the 23, 11 were excluded due to out-of-scope outcomes (n = 1), publication type (n = 5), and language (n = 5), resulting in 12 studies. Two additional studies were identified from reference lists, totalling 14 studies for knowledge synthesis (Table 2).

Regarding methodological characteristics, the included studies comprised methodological studies (n = 3)[23,24,25], randomized controlled trials (n = 2)[26,27], non-randomized clinical trials (n = 2)[28,29], in addition to qualitative studies (n = 2)[30,31], cohort studies (n = 2)[32,33], cross-sectional (n = 1)[34], prospective observational (n = 1)[35] and quasi-experimental (n = 1)[36]. Nine studies were conducted in the United States of America (USA)[24,27-33,35], while the others took place in the United Kingdom[23], Thailand[34], Switzerland[25], Germany[26] and Australia[36]. Regarding authorship, there was a predominance of medical professionals (n = 10), followed by Pharmacy (n = 4), Nursing (n = 3), Psychology (n = 2) and Computer Engineering (n = 1), reflecting the multi-professional nature of the literature on the subject. Identification data, design, level of evidence, and methodological quality of the included studies are presented in Table 3.

Table 2. Flowchart of the study selection process (adapted from PRISMA 2020).

Identification	Screening	Inclusion
Records identified in databases (n = 731): PubMed = 131; CINAHL = 114; LILACS = 17; Scopus = 317; WoS = 96; Embase = 56. Duplicates removed (n = 152).	Records screened by title/abstract (n = 579). Excluded (n = 556). Studies assessed in full text (n = 23). Excluded (n = 11): outcome out of scope (1); publication type (5); language (5).	Studies included from databases (n = 12). Studies included via manual search of references (n = 2). Total studies included (n = 14).

Source: Elaborated by the authors. Adapted from Page et al.[16].

Table 3. Identification, design, level of evidence, and methodological quality of the included studies (n = 14).

Study (year)	Country	Study design	Level of Evidence	Quality
Bufton (2005)[23]	United Kingdom	Methodological	Unclassifiable	Not applicable
Perez et al. (2007)[24]	USA	Methodological	Unclassifiable	Not applicable
Klein et al. (2009)[26]	Germany	Randomized clinical trial	Level I	A
Jerson et al. (2013)[28]	USA	Non-randomized clinical trial	Level II	B
McLin et al. (2013)[25]	Switzerland	Methodological	Unclassifiable	Not applicable
McKenzie et al. (2015)[29]	USA	Non-randomized clinical trial	Level II	B
Asavakarn et al. (2016)[34]	Thailand	Cross-sectional	Level III	B
Ertel et al. (2016)[35]	USA	Prospective observational	Level III	B
Zanetti-Yabur et al. (2017)[32]	USA	Prospective cohort	Level III	B
Dhar et al. (2018)[30]	USA	Qualitative	Level III	A
Leek et al. (2019)[33]	USA	Prospective cohort	Level III	B
Lieber et al. (2021)[31]	USA	Qualitative	Level III	A
Culnane et al. (2022)[36]	Australia	Quasi-experimental	Level II	B
Sayegh et al. (2022)[27]	USA	Pilot randomized clinical trial	Level I	B

Note: Levels and quality according to the Johns Hopkins Nursing Evidence-Based Practice20 model. The methodological studies were classified by the authors themselves and were not appraised with this tool, as their design presents specific features not covered by the instrument. Source: Elaborated by the authors.

Detailed methodological quality assessment is presented in Table 4 for quantitative studies and Table 5 for qualitative studies. Among the quantitative studies, the criteria most frequently unmet were the currency of the literature review (only one study presented updated references)[35] and the discussion of instrument validity (discussed in only one study)[26]. Four studies did not provide a sufficient sample size[27,32,35,36], and three did not use instruments considered reliable[34-36]. Regarding qualitative studies, only the acknowledgment of the researcher's role and potential influence during data collection was not addressed in the two evaluated studies[30,31]. Overall, two studies were classified as Level I, and the others as Levels II and III, with grade A or B quality—which lends consistency to the synthesized body of evidence.

Table 4. Methodological quality assessment of quantitative studies (*Research Evidence Appraisal Tool – Johns Hopkins Nursing Evidence-Based Practice*).

Criteria	Klein (2009)	Jerson (2013)	McKenzie (2015)	Asavakarn (2016)	Ertel (2016)	Zanetti-Yabur (2017)	Leek (2019)	Culnane (2022)	Sayegh (2022)
LE	I	II	II	III	III	III	III	II	I
Q1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Q2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Q3	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Q4	No	No	No	No	Yes	No	No	No	No
Q5	Yes	Yes	Yes	Yes	No	No	Yes	No	No
Q6	Yes	Yes	Yes	NA	NA	NA	NA	Yes	Yes
Q7	NA	NA	NA	NA	NA	NA	NA	NA	NA
Q8	Yes	Yes	Yes	NA	NA	NA	NA	Yes	Yes
Q9	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Q10	Yes	Yes	Yes	No	No	Yes	Yes	No	Yes
Q11	Yes	No	No	No	No	No	No	No	No
Q12	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Q13	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Continue...

Table 4. Continuation.

Criteria	Klein (2009)	Jerson (2013)	McKenzie (2015)	Asavakarn (2016)	Ertel (2016)	Zanetti-Yabur (2017)	Leek (2019)	Culnane (2022)	Sayegh (2022)
Q14	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Q15	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes
Q16	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quality	A	B	B	B	B	B	B	B	B

Note: LE = Level of Evidence; NA = not applicable. Q1: identifies what is known and unknown about the problem; Q2: identifies how the study addresses knowledge gaps; Q3: clearly stated objective; Q4: current literature review; Q5: sufficient sample size; Q6: similar characteristics between groups; Q7: similar settings; Q8: groups treated equally except for the intervention; Q9: objectively described data collection methods; Q10: reliable instruments (Cronbach's alpha > 0.70); Q11: instrument validity discussed; Q12: response rate > 25%; Q13: clearly presented results; Q14: narrative consistent with tables; Q15: identified limitations; Q16: conclusions based on results. Source: Elaborated by the authors, adapted from Dang et al.[20].

Table 5. Methodological quality assessment of qualitative studies (*Research Evidence Appraisal Tool – Johns Hopkins Nursing Evidence-Based Practice*).

Criteria	Dhar et al. (2018)	Lieber et al. (2021)
Level of Evidence	III	III
Q1 – purpose of the problem	Yes	Yes
Q2 – research question	Yes	Yes
Q3 – Justification/Theoretical Framework	Yes	Yes
Q4 – participants with knowledge of the topic	Yes	Yes
Q5 – participant characteristics described	Yes	Yes
Q6 – verification process (credibility)	Yes	Yes
Q7 –documentation of decisions (dependability)	Yes	Yes
Q8 – rich description of findings (transferability)	Yes	Yes
Q9 – acknowledges researcher's role/influence	No	No
Q10 – adequate sampling (saturation)	Yes	Yes
Q11 – provides data illustrations	Yes	Yes
Q12 – illustrations support conclusions	Yes	Yes
Q13 – congruence between findings and data	Yes	Yes
Q14 – methodology-question congruence	Yes	Yes
Q15 – methodology/data collection congruence	Yes	Yes
Q16 – congruence between methodology and interpretation	Yes	Yes
Q17 – discussion/conclusions supported by literature	Yes	Yes
Q18 – conclusions based on collected data.	Yes	Yes
Quality	A	A

Source: Elaborated by the authors, adapted from Dang et al.[20].

The educational technologies identified, target audience, and synthesis of interventions are described in Table 6.

Table 6. Educational technologies, target audience, and synthesis of interventions of the included studies.

Study (year)	Target audience	Educational technology	Description/main results
Bufton (2005)[23]	Pediatric	Educational booklet	Educational booklet "New liver for my mom or dad" for children of adult transplant recipients; helped reduce fear and anxiety and improve children's understanding of the process.
Perez et al. (2007)[24]	Adult	Electronic multidisciplinary teaching tool and manual	Pre- and post-transplant manuals and multidisciplinary electronic tool to document teaching and assess discharge readiness, reducing redundancy and improving the quality of education.
Klein et al. (2009)[26]	Adult	Pharmaceutical care program with electronic monitoring	12-month pharmaceutical care program with electronic monitoring (MEMS); improved adherence to immunosuppressive therapy.
Jerson et al. (2013)[28]	Young adult	Peer mentorship program	Peer mentorship between different ages; proved feasible and safe for improving adherence and psychosocial outcomes.
McLin et al. (2013)[25]	Pediatric	Digital platform and mobile app	KidsETransplant platform (website, interactive forum, and app) for children and families; positive preliminary feedback.

Continue...

Table 6. Continuation.

Study (year)	Target audience	Educational technology	Description/main results
McKenzie et al. (2015)[29]	Adolescent	Text messaging program	Automated text message reminders improved participation in laboratory tests.
Asavakarn et al. (2016)[34]	Adult	Multidisciplinary educational program (S-SMAOT)	Three-stage pharmaceutical program; multidisciplinary approach associated with better adherence outcomes.
Ertel et al. (2016)[35]	Adult	Educational videos and tablet monitoring	Ten educational videos and home monitoring of vital signs via tablet; high patient adherence and satisfaction.
Zanetti-Yabur et al. (2017)[32]	Adult	Mobile app (Transplant Hero)	Medication adherence app; users showed higher adherence than non-users.
Dhar et al. (2018)[30]	Adult	Social media (Facebook)	Virtual Facebook community; 95% reported a positive impact on care and 97% valued peer support.
Leek et al. (2019)[33]	Adult	Educational leaflet and goal setting	A pamphlet on chronic kidney disease, adapted from the Kidney Disease Knowledge Survey after Liver Transplant (KiKs-LT), increased knowledge about the condition.
Lieber et al. (2021)[31]	Adult	Smartphone app (LiveRight prototype)	Interviews regarding the development of the application showed that 77% of participants considered a smartphone-based intervention useful for recovery.
Culnane et al. (2022)[36]	Pediatric/ transition	Transition program with consultations	A transition program to adult care improved knowledge, adherence, and satisfaction.
Sayegh et al. (2022)[27]	Adolescent/ young adult	Praise text messages	Test-linked praise messages were deemed acceptable and encouraging yet require further refinement.

Source: Elaborated by the authors.

DISCUSSION

This integrative review highlighted the relevance of educational technologies in the care of liver transplant recipients, for patients as well as their caregivers and family members. The studies analyzed addressed various technologies, focusing on medication management, clinical follow-up, and adaptation to a new lifestyle after the transplant.

The identified technologies can be categorized, according to Merhy's classification, into hard, soft-hard, and soft technologies[37,38]. Hard technologies correspond to tangible products, such as the educational booklet[23], the multidisciplinary electronic teaching tool[24], the tablet and the educational videos[35], the leaflet[33] and the mobile applications[31,32]. Soft-hard technologies involve work processes and methods, such as electronic medication adherence monitoring[26,34] and personalized educational sessions[33]. In turn, soft technologies, which are interactive and relational in nature, include text messaging programs[27,29], social media[30] and mentorship programs[28,36], which promote engagement and the building of support networks.

Technologies can also be understood as product technologies and process technologies[39,40]. Product technologies provide physical and digital resources for teaching, whereas process technologies supply methods and strategies for the implementation of educational interventions[41]. The availability of both facilitates a comprehensive and personalized approach capable of meeting the diverse needs and preferences of patients[42]. This diversity can be further organized into printed materials, electronic materials, human interaction, and digital materials, categories that represent distinct delivery methods and forms of interaction with the educational content[42].

Regarding printed materials, the booklet designed for children of transplant recipients provided a realistic representation of the process, addressing complications and recovery prospects[23]. Literature on kidney transplantation indicates that both printed materials and interactive multimedia resources can improve patients' quality of life, suggesting complementary approaches and highlighting the importance of the design and quality of printed materials[43]. Similarly, the educational leaflet on chronic kidney disease after liver transplantation expanded patients' knowledge[33], reinforcing the evidence that personalized written materials are effective in educating and empowering patients for self-care[44].

The introduction of a flipchart as part of a three-stage pharmaceutical program reinforced the importance of medication adherence at different points of care[34]. A systematic review on kidney transplantation highlights the need for multidisciplinary approaches and educational interventions delivered across distinct post-transplant phases, considering not only adherence but also lifestyle and signs of rejection[45]. These findings converge with a study demonstrating the benefits of a multidisciplinary electronic teaching tool in teaching documentation, staff satisfaction, and continuity of care[24]; and with the literature highlighting the need for information during clinical transitions, such as graft dysfunction[46].

Regarding human interaction, the pharmaceutical care program increased adherence to immunosuppressive therapy and reduced rejection episodes[26]; the peer mentoring program proved feasible and safe for improving adherence and psychosocial outcomes in adolescents[28]; and the transition program to adult care demonstrated improvements in adherence, reductions in rejection rates, and patient satisfaction[36]. These findings highlight the value of personalized and continuous support in the care of liver transplant recipients.

Regarding digital materials, the KidsETransplant platform provided children and families with access to medical records and medication reminders[25]; the mobile app was associated with higher medication adherence[32]; while the development of an app prototype based on patient needs highlighted the demand for tools supporting post-transplant recovery[31]. These findings reinforce the potential of digital technologies as complementary tools in promoting self-care and treatment adherence.

In the field of social media, the creation of a virtual community on Facebook provided support, inspiration, and educational content to patients[30]. Literature points to the high global reach of these platforms, especially among young adults[47], and the frequent use of social media by transplant professionals to access information on donation and transplantation[48]. However, privacy and authenticity concerns demand attention to ethical and trust issues in the use of these platforms[48]. Social media also prove relevant for educating candidates, potential donors, and their support networks, disseminating complex information on risks, benefits, and alternatives related to donation and transplantation[49,50].

Text messaging interventions have emerged as a promising strategy to improve adherence and engagement post-transplant51. The use of personalized messages increased participation in laboratory tests[29]. Similarly, praise-based messages proved well accepted and potentially effective in medication adherence among adolescents and young adults, although they still require refinement[27]. Additional studies corroborate the acceptability of these interventions and their impact on knowledge, self-efficacy, and adherence among patients with chronic conditions[52-54]. These findings highlight the potential of text messaging as a versatile and low-cost tool in the context of telehealth.

Regarding multimedia resources, the use of educational videos and home monitoring via tablet favoured patients' awareness and understanding of post-transplant care, despite the observed readmission rate[35]. The scarcity of studies on the use of videos and tablets in this specific context reinforces the need for further research.

A relevant aspect is that, among the 14 included studies, no validation steps for educational technologies were identified, which constitutes a significant gap. The validation of health educational materials is essential to ensure quality, relevance to the target audience, technical accuracy, and broad dissemination, contributing to the effectiveness of teaching in different contexts[55].

Some limitations must be considered. The heterogeneity of study designs may influence the interpretation of results; the restriction to specific languages and databases may have excluded relevant studies; and quality assessment, based on specific criteria, may introduce some degree of subjectivity in classifying levels of evidence. Furthermore, gaps remain that demand prospective, robust studies evaluating the efficacy, practical implementation, and long-term impact of these interventions, as well as research focused on specific subgroups—such as children, adolescents, and older adults—and aspects of cultural and social diversity.

CONCLUSION

The available evidence on educational technologies aimed at liver transplant recipients is diverse and consistent. Technologies such as mobile apps, digital platforms, text messaging, educational videos, social media, booklets, brochures, mentoring programs, and electronic multidisciplinary teaching tools play a significant role in supporting patient education, treatment monitoring, and social support. These technologies have proven useful in promoting medication adherence, symptom monitoring, and access to information on transplantation and postoperative care, thereby contributing to recipients' quality of life and social reintegration.

In addition to supporting therapeutic management, educational technologies enrich patients' social experiences by fostering the creation of support communities. These tools should be designed to provide continuous support—available whenever needed—and undergo validation processes to ensure their quality. Finally, the scarcity of Brazilian studies on this subject is noteworthy, underscoring the need for local research to understand the impact of these technologies within the national context and to adapt them to the specific needs of the liver transplant recipient population.

CONFLICT OF INTEREST

Nothing to declare.

AUTHOR'S CONTRIBUTION

Substantive scientific and intellectual contributions to the study: Mendes KDS, Nakano NM, Galvão CM; **Conception and design:** Mendes KDS, Nakano NM, Ferreira IB; **Data analysis and interpretation:** Mendes KDS, Nakano NM, Ferreira IB; **Article writing:** Mendes KDS, Nakano NM, Galvão CM; **Critical revision:** Mendes KDS, Nakano NM, Galvão CM, Ferreira IB; **Final approval:** Mendes KDS.

DATA AVAILABILITY STATEMENT

All datasets were generated or analyzed in the current study.

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DECLARATION OF USE OF ARTIFICIAL INTELLIGENCE TOOLS

The authors declare that they used the generative artificial intelligence tool Claude (Anthropic, model Opus 4.8) exclusively for language editing and to improve the clarity and flow of the text. All content was reviewed and validated by the authors, who assume full responsibility for the final version of the manuscript.

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