

Telehealth implementation for children with attention deficit hyperactivity disorder: a scoping review

Dian Susmarini^{1,2}, Hyewon Shin², Sunyeob Choi³

¹Graduate student, College of Nursing, Ewha Womans University, Seoul, Korea

²Associate Professor, College of Nursing, Ewha Womans University, Seoul, Korea

³Assistant Professor, Dongguk University WISE, Gyeongju, Korea

Corresponding author

Hyewon Shin

College of Nursing, Ewha Womans University, 52 Ewhayeodae-gil, Seodaemun-gu, Seoul 03760, Korea
TEL: +82-2-3277-3305
FAX: +82-2-3277-2850
E-MAIL: hyeshin@ewha.ac.kr

Received: July 4, 2024

Revised: August 14, 2024

Accepted: September 5, 2024

The objective of this research was to examine current telehealth practices in managing children with attention deficit hyperactivity disorder (ADHD) and to map existing implementations using the American Medical Association's Virtual Care Value Framework. A scoping review was conducted following the Arksey and O'Malley framework. The databases, CINAHL, PsycINFO, and PubMed, were searched with specific keywords related to telehealth and ADHD. The screening process followed the Preferred Reporting Items for Systematic reviews and Meta-Analyses guidelines. Inclusion criteria were restricted to articles published in English between January 2000 and July 2024, focusing on children with ADHD, their parents, caregivers, family members, teachers, healthcare professionals, and articles implementing telehealth interventions. As a result, out of 389 initially identified articles, 22 met the inclusion criteria. The studies were predominantly conducted in the United States. The most common telehealth methods included video-conferencing and telephone-based communications. Key areas of focus in these studies included clinical outcomes, access to care, patient and family experience, caregiver experience, clinician experience, and financial and operational impact. However, none of the studies addressed health equity. In conclusion, telehealth has shown effectiveness in improving ADHD assessment, treatment adherence, and parental education, leading to positive patient outcomes and experiences. However, the financial impact of telehealth remains uncertain. Further research is needed, particularly outside the United States, to explore emerging telehealth technologies and areas overlooked by the Virtual Care Value Framework, such as health equity.

Keywords: Adolescent; Attention deficit disorder with hyperactivity; Child; Telemedicine

INTRODUCTION

Attention deficit and hyperactivity disorder (ADHD) is a neurodevelopmental disorder characterized by hyperactivity, impulsivity, and inattentiveness [1]. Globally, the prevalence of ADHD ranges from 5.3% to 7.1% among children and adolescents and 2.6% to 2.8% among adults [2]. It per-

sists into adulthood in two-thirds of patients diagnosed during childhood [3]. Challenges associated with ADHD extend beyond primary symptoms to encompass associated complications [4]. These include comorbidities such as anxiety, behavioral disorders, learning and language disorders, and Tourette syndrome [1]. As children with ADHD mature, environmental support decreases while academic, social, and

This is an Open Access article distributed under the terms of the Creative Commons Attribution NonCommercial License (<https://creativecommons.org/licenses/by-nc-nd/4.0/>) which permits unrestricted noncommercial use, distribution, and re-production in any medium, provided the original work is properly cited.

© 2024 Korean Academy of Child Health Nursing

environmental demands increase. Consequently, during adolescence, these individuals often exhibit academic and social skills below those of their peers and may additionally manifest emotional dysregulation, self-harm, mood disorders, and eating disorders [4].

ADHD treatment encompasses both pharmacotherapy and non-pharmacotherapy. First-line pharmacological treatments such as stimulants aid in concentration and demonstrate efficacy and safety in addressing ADHD [5]. Children are typically prescribed methylphenidate, while adults receive dextroamphetamine [6]. Non-pharmacological interventions include cognitive behavioral therapy, introduced at the age of six, which can be combined with pharmacotherapy if behavioral therapy is insufficient [7,8]. With the increasing digitalization of healthcare, innovative approaches such as telehealth are being embraced more frequently to assist in treating ADHD.

Telehealth has emerged as an increasingly prevalent tool for ADHD treatment, aligning with studies discussing its application in chronically ill children [9-11]. Telehealth employs communication and information technologies to extend access to healthcare services, including assessments, diagnoses, interventions, and remote communication [12]. Although often interchanged with telemedicine, a narrower term denoting real-time remote interaction between patients and healthcare professionals, telehealth has shown promise in enhancing healthcare for chronically ill children [13,14]. Telehealth offers significant benefits, including reduced office visits [10,13,15], improved patient compliance, reduced risk of infection from waiting room exposure [16], and increased time for at-home care [11]. These advantages are particularly evident among patients living in rural areas [10].

Studies in this population, including reviews on digital health and telehealth interventions for children with ADHD, have focused on treatment to alleviate [17,18] the feasibility and comparative effectiveness of virtual versus in-person visits, often overlooking the holistic value of digitally enabled care models [19]. This study aimed to narrow the gaps in telehealth research by thoroughly examining existing research on telehealth implementation to improve care delivery for children with ADHD by applying the American Medical Association (AMA) Virtual Care Value Framework.

The framework comprises six key aspects: clinical outcomes, quality and safety, access to care, patient, family, and caregiver experience, clinician experience, financial and operational impact; and health equity [19]. Clinical outcomes,

quality, and safety highlight the effectiveness of care modalities in promoting health, maintaining care standards, and safeguarding patients. Access to care refers to the extent to which virtual care programs can minimize barriers, thereby enhancing the availability, suitability, and affordability of prompt medical care. Patient, family, and caregiver experiences accounted for the overall impressions of the clinical and technological facets of virtual care from the perspectives of patients and their support networks. The clinicians' experiences examine how virtual care adoption affects their work and technological interactions, potentially facilitating patient care, flexible work arrangements, and easy peer connections. Financial and operational impacts assess the effects of virtual care adoption on financial sustainability and operational efficiency by considering factors such as direct and indirect revenues, direct expenses, and operational efficiency. Finally, health equity seeks to understand and address the differential impacts of virtual care programs on historically marginalized patient groups across various value streams.

This scoping review aims to comprehensively understand telehealth practices for children with ADHD. The goal is to identify gaps in current research and practice and to provide insights that will inform future research and clinical practice, aiming to improve the quality of care and outcomes for children with ADHD. This study aims to achieve two objectives: first, to identify current telehealth practices in the clinical management of children diagnosed with ADHD, and second, to map existing implementations using the Virtual Care Value Framework.

METHODS

Ethical statements: As the study is a review study, IRB is not required.

1. Study Design

The research design details the general structure and methodology of this study, including the techniques employed for data collection and analysis. This ensures that the research questions are efficiently addressed. We adopted Arksey and O'Malley's five-stage approach for a comprehensive review [20]. This study followed the criteria of the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) checklist [21].

2. Study Process

The study process included: (1) formulating the research question, (2) identifying relevant studies, (3) selecting studies, (4) organizing the data, and (5) summarizing and presenting the results [22].

3. Research Question

This review aims to explore current telehealth practices for managing children with ADHD and to assess how the Virtual Care Value Framework influences these practices. The selection of questions aligns with the increasing importance of telehealth in managing chronic conditions in the current healthcare landscape [23]. This scoping review aims to fill a gap in the literature on specific telehealth practices and frameworks for ADHD management. In doing so, they seek to optimize telehealth services [24,25], improve guidelines [26], develop training programs [27], and create tailored healthcare delivery strategies [24], ultimately enhancing patient outcomes and healthcare efficiency in children with ADHD.

The research questions were: (1) What are the current telehealth practices for managing ADHD in children? (2) How does the Virtual Care Value Framework inform the care provided to children with ADHD through telehealth services?

4. Inclusion and Exclusion Criteria

The criteria for inclusion in this review were established by selecting articles that met the following requirements: (1) published between January 2000 and July 2024 (as telehealth studies related to children with ADHD began to emerge from 2000 onwards); (2) written in English; (3) involved children with ADHD, their parents or caregivers, family members, teachers, and healthcare professionals; and (4) included telehealth interventions. Studies related to telehealth for chil-

dren with ADHD began to emerge in 2000. Review articles, opinion-based articles, editorials, conference proceedings, and studies published in languages other than English were excluded. The search strategy adhered to the Joanna Briggs Institute’s three steps: initial search, second search, and reference list search [28].

5. Finding Relevant Studies

A librarian formulated the search strategy and determined the appropriate databases to search for relevant studies. Initially, a preliminary search was conducted in the Cumulative Index to Nursing and Allied Health Literature (CINAHL) database to identify appropriate search terms. These terms were modified and refined to formulate the final accurate search terms. Subsequently, a comprehensive search was performed in the CINAHL, PsycINFO, and PubMed databases using the final search terms. CINAHL and PubMed are widely regarded as dependable and trustworthy databases unlikely to yield citations from predatory publications [29]. Additionally, PsycINFO can be used to locate specialized databases [29]. Table 1 presents the keyword search list.

6. Selecting Studies

To facilitate the selection of studies, the search results were exported to Endnote, a reference management tool, following PRISMA guidelines [22]. A four-step approach was adopted to ensure systematic and transparent screening. The initial screening involved evaluating the relevance of articles based on their titles. Subsequently, the abstracts of the potentially relevant articles were reviewed to determine their suitability for inclusion. For articles that passed the abstract screening, the full text was thoroughly examined. In addition, the reference lists of the selected articles were searched to identify additional relevant studies that may have been missed. Three reviewers were involved throughout the screening process,

Table 1. Keywords Search

Databases	Search terms
CINAHL	(Child OR Adolescent) AND (Attention Deficit Disorder with Hyperactivity) AND (Telemedicine OR Patient Portals OR Decision Making, Computer-Assisted OR Internet-Based Intervention OR Remote Consultation)
PsycInfo	((Adolescent Development) OR (Adolescent Psychology)) AND (Attention Deficit Disorder with Hyperactivity) AND ((Telemedicine) OR (Telepsychiatry) OR (Online Therapy) OR (Websites) OR (Digital Interventions))
PubMed	((Child[MH] OR Adolescent[MH]) AND (Attention Deficit Disorder with Hyperactivity[MH])) AND (Telemedicine[MH] OR Patient Portals[MH] OR Decision Making, Computer-Assisted[MH] OR Internet-Based Intervention[MH] OR Remote Consultation[MH])

CINAHL, Cumulative Index to Nursing and Allied Health Literature.

including the initial screening, to ensure consistency and minimize bias. In case of disagreement regarding the inclusion of certain papers, discussions were held to reach a consensus.

7. Organizing Data, Summarizing, and Reporting the Results

This scoping review included 22 articles that the research team carefully extracted and organized into a Microsoft Excel 2021 (Microsoft) spreadsheet. The data extraction form was initially tested in two articles for comprehensive information coverage [30,31]. Subsequently, this method was applied to the remaining articles, which were divided equally between two reviewers (SC and DS). The accuracy and consistency of the findings are verified. Discrepancies were resolved through consultation with a third reviewer (HS). The extract-

ed information included key details such as author, title, year of publication, study aim, study design, sample size, and the specific telehealth device used in each study. Furthermore, the team identified and documented information related to telehealth implementation according to the framework of the AMA [19]. The studies were systematically delineated using tables that detailed demographic characteristics and provided a year-based chronology.

RESULTS

1. Search Result

A systematic review was conducted using the PRISMA flowchart, involving a comprehensive search across multiple databases (Figure 1). Initially, 389 articles were identified

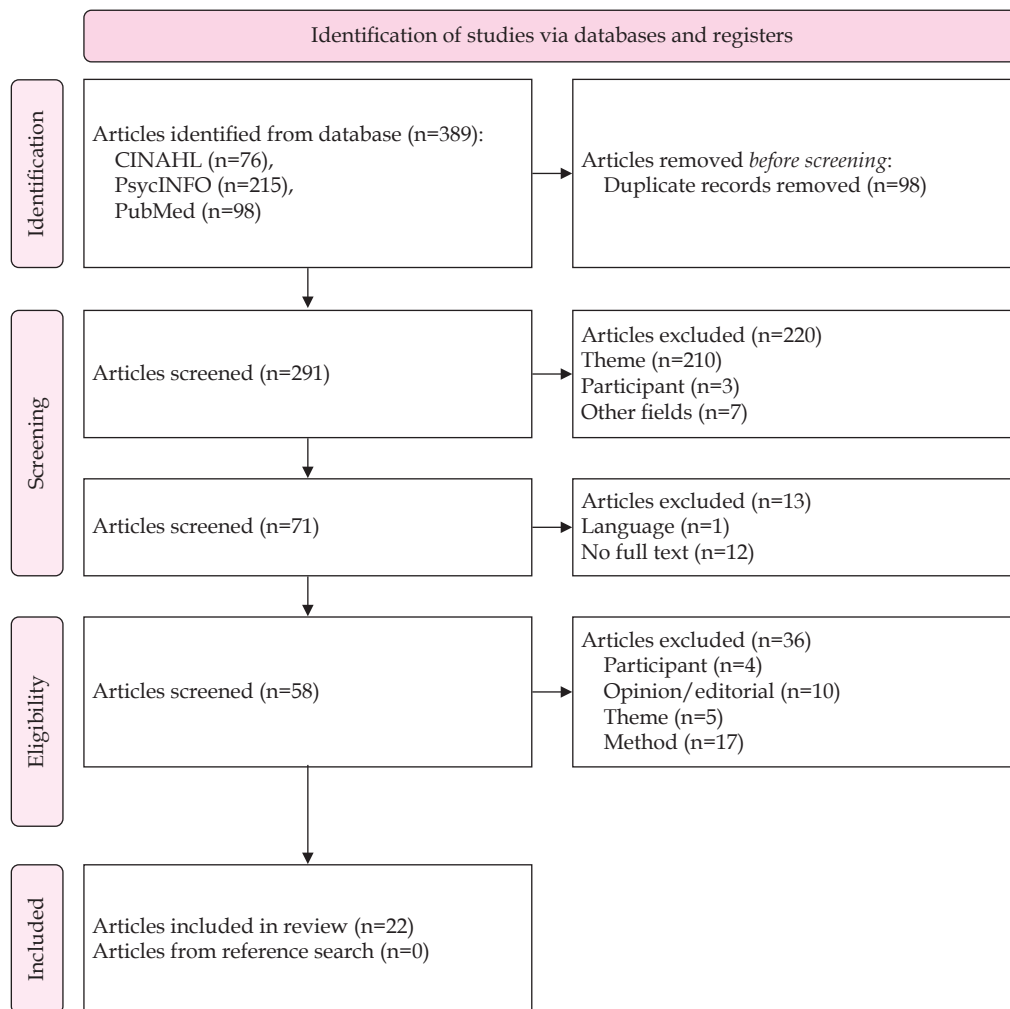


Figure 1. Preferred Reporting Items for Systematic reviews and Meta-Analyses flowchart for the scoping review.

from CINAHL (n=76), PsycINFO (n=215), and PubMed (n=98) databases. After eliminating duplicates, 291 articles underwent relevance screening, and 220 were excluded for various reasons, such as differing themes and participants. The remaining 71 articles underwent full-text screening, of which 13 were excluded because of language (not in English) or lack of full-text availability. Following the eligibility assessment, 36 articles were excluded based on participant-related factors, opinion/editorial content, misalignment with the study's theme, and methodological issues. Finally, the review included 22 articles, and no additional articles were identified through the reference list searches.

We divided the content into charting the data and collecting, summarizing, and reporting the results.

2. Charting the Data

Charting data involves organizing and systematically arranging the collected data to facilitate analysis. This step ensures that all relevant information is accurately captured and categorized. Twenty-two studies were included in this review. These studies employed diverse methodologies, including randomized controlled trials (n=16) [24,30-44], cluster randomized trials (n=3) [45-47], and quasi-experiments (n=3) [48-50]. Geographically, the studies were primarily conducted in the United States (US) (n=12), with additional locations including Germany (n=3), Australia, Brazil, China, Canada, Israel, Japan, and the United Kingdom (UK), each contributing to one study. The most frequently used methods of interaction were videoconferencing (n=8) and web-based platforms (n=8), followed by telephone-based interactions (n=6) and mobile apps (n=3). Regarding professional engagement, psychiatrists participated in 11 studies, followed by psychologists (n=8), physicians (n=8), and nurses (n=6). Telehealth usage was mainly as a means for treatment (n=22), and two for diagnostic purposes. Other key aspects of each study, such as authors, publication year, aims, participant demographics, devices used, and health professionals involved, and main findings are shown in Table 2.

3. Collating, Summarizing, and Reporting the Results

Collating, summarizing, and reporting results involve synthesizing organized data to draw meaningful conclusions and effectively communicate the findings. The implementation of telehealth services for children with ADHD has been

Table 2. Study Demographics (N=22)

Authors	Countries	Aims	Design	Sample size	Devices	The involved health professionals	Outcomes
Epstein et al. (2011) [45]	USA	To determine whether an ADHD QI intervention for community-based pediatric practices improves patient outcomes	CRT	49	Web-portal	Pediatricians and nurse practitioners	The intervention group had greater adherence to ADHD care practices, including the use of parent and teacher rating scales, documentation of DSM-IV criteria, and monitoring treatment responses. They also showed a reduced reliance on mental health referrals for ADHD diagnosis
Reese et al. (2012) [49]	USA	To measure the effectiveness of triple P (positive parenting program)	Quasi-experimental	8	Videoconference	Psychologist and pediatrician	The intervention group had significantly higher medication adherence, lower ADHD symptoms, greater improvements in knowledge and adherence intentions, and higher parental satisfaction

(Continued to the next page)

Table 2. Continued

Authors	Countries	Aims	Design	Sample size	Devices	The involved health professionals	Outcomes
Xie et al. (2013) [38]	USA	To evaluate the effectiveness of group parent training on ADHD treatment delivered via videoconferencing	RCT	22	Videoconference	Psychiatrist	The intervention group had similar improvements in parent-child disciplinary practices, greater improvement in hyperactive symptoms, similar gains in social skills, and comparable overall functioning in children
Myers et al. (2015) [24]	USA	To test the effectiveness of a telehealth RCT service delivery model for the treatment of children with ADHD that provided pharmacological treatment and caregiver behavior training	RCT	223	Videoconference	Psychiatrist	The intervention group had greater improvements in inattention, hyperactivity, combined ADHD, and ODD symptoms, better role performance and overall impairment, and greater improvement in hyperactivity and combined ADHD symptoms according to teacher ratings.
Tse et al. (2015) [36]	USA	To examine the effectiveness of CATTs to families residing in their homes using distant technologies	RCT	37	Video teleconference	Psychiatrist	The intervention group had similar improvements in ADHD symptoms and role performance, as well as comparable global functioning and overall improvement in children. However, caregivers in the teletherapy group reported less improvement in caregiver strain and empowerment
Bai et al. (2015) [46]	China	To evaluate the efficacy of a psychoeducation program for parents of children with ADHD in enhancing adherence to pharmacological treatment and improving clinical symptoms	CRT	89	Website	All health professionals	The intervention group had significantly higher medication adherence, lower ADHD symptoms, greater improvements in parent knowledge and intentions, and higher parental satisfaction
Rockhill et al. (2016) [44]	USA	To examine the prescribing strategies that telepsychiatrists used to provide pharmacologic treatment in the CATTs	RCT	223	Videoconference	Psychiatrist	The intervention group had greater adherence to the treatment protocols, higher attainment of the treat-to-target goal, and more frequent medication adjustments based on ADHD severity and comorbidity status
Corkum et al. (2016) [31]	Canada	To evaluate the effectiveness of a five-session behavioral sleep disturbance intervention (delivered via written manual with telephone support by a paraprofessional coach) for parents of school-aged children with insomnia	RCT	61	Telephone	Paraprofessionals, psychologist	The intervention group had significantly greater improvements in sleep onset latency, bedtime resistance, and sleep duration, as well as improved psychosocial functioning. Parents in the intervention group also reported high satisfaction with the program

(Continued to the next page)

Table 2. Continued

Authors	Countries	Aims	Design	Sample size	Devices	The involved health professionals	Outcomes
Epstein et al. (2016) [33]	USA	To determine whether an ADHD QI intervention for community-based pediatric practices improves patient outcomes	RCT	577	Web-portal	Pediatricians and nurse practitioners	The intervention group had more frequent patient contacts, greater collection of parent and teacher ratings, and a significantly greater reduction in parent-rated ADHD symptoms among children prescribed medication
Franke et al. (2020) [34]	Australia	To evaluate the efficacy of an online self-help program in a sample of parents of preschoolers with ADHD symptoms	RCT	53	Website and telephone	Psychologist	The intervention group had greater improvements in child hyperactivity/inattention, restlessness/impulsivity, social functioning, and defiance/aggression, as well as significant improvements in parenting practices, parenting satisfaction, and maternal well-being
Dose et al. (2017) [32]	Germany	To examine whether a TASH parenting behavioral intervention (written materials plus telephone counseling) enhanced the effects of methylphenidate treatment in children with ADHD	RCT	103	Telephone	Psychiatrist	The intervention group showed significant improvements in ADHD symptoms, particularly inattention, and functional impairment. However, when controlling for medication effects, the improvement in ADHD symptoms was less clear
Fiks et al. (2017) [47]	USA	To evaluate a distance-learning, quality improvement intervention to improve pediatric primary care provider use of ADHD rating scales	CRT	105	Website, telephone	Pediatricians and nurse practitioners	The intervention group showed no significant improvement in ADHD rating scale use compared to the control group
Vander Stoep et al. (2017) [37]	USA	To evaluate the CATTs on caregiver's outcomes	RCT	223	Videoconference	Psychiatrist	The intervention group had significantly greater improvements in ADHD symptoms, including inattention and hyperactivity
DuPaul et al. (2018) [43]	USA	To examine parent engagement and program acceptability of F2F and online BPT, as well as the efficacy of both formats relative to a WLC group	RCT	47	Website	Psychologist	The intervention group had greater improvements in ADHD symptoms, including inattention and hyperactivity, along with better treatment fidelity and parent knowledge of behavioral strategies. Both face-to-face and online formats showed similar efficacy, but face-to-face had higher parent satisfaction
Hollis et al. (2018) [35]	UK	To evaluate the impact of QbTest on clinical diagnostic decision-making when added to routine clinical assessment of ADHD compared to assessment as usual using a pragmatic diagnostic RCT design	RCT	250	Website	Consultant psychiatrists, paediatricians, nurse specialists and health-care assistants	The intervention group had significantly greater improvements in diagnostic decision-making efficiency, with more participants receiving an ADHD diagnosis, reduced consultation times, and higher clinician confidence. However, there was no significant difference in diagnostic accuracy between the groups
Weisman et al. (2018) [40]	Israel	To assess the utility and effectiveness of a mobile app in improving adherence to stimulants among children with ADHD	RCT	39	Mobile apps	Psychiatrist	The intervention group (using the mobile app) had significantly higher medication adherence, as indicated by pill counts, but the app did not significantly impact ADHD symptom severity

(Continued to the next page)

Table 2. Continued

Authors	Countries	Aims	Design	Sample size	Devices	The involved health professionals	Outcomes
Dose et al. (2020) [30]	Germany	To examine change in individually defined problem behaviors during a TASH intervention for parents of children with ADHD	RCT	103	Telephone	Psychiatrist	The intervention group had significantly greater improvements in ADHD symptoms, including inattention and hyperactivity, as well as better functional impairment outcomes when controlling for medication effects
Fried et al. (2020) [48]	USA	To examine the effectiveness of a novel ADHD-centric text messaging-based intervention aimed to improve adherence to stimulant medications in children with ADHD	Quasi-experimental	333	Text message/mobile	Nurse, doctor, psychologist	The intervention group had significantly higher medication adherence. However, the intervention did not significantly impact the severity of ADHD symptoms
Breaux et al. (2021) [50]	USA	To evaluate the feasibility, acceptability, and efficacy of RELAX across in-person and telehealth groups	Quasi-experimental	32	Videoconference	Psychologist	The intervention group had similar improvements in emotion dysregulation (ED) and family conflict. However, the intervention group showed greater improvements in clinician-reported adolescent ED, while the in-person group had more significant reductions in caregiver-adolescent conflict
Kurokawa et al. (2024) [39]	Japan	To examine the result similarity between the remote and face-to-face ADHD assessment	RCT	74	Mobile apps	Psychologist	There was a similarity between remote and face-to-face ADHD-RS-IV assessment
Paiva et al. (2024) [41]	Brazil	To compare symptoms, parental style, quality of life, and perceived stress; children's quality of life	RCT	57	Website	Psychologist	Online and face-to-face parent training were effective in reducing symptom, and online intervention is effective for parenting and enhancing children's social acceptance
Wähnke et al. (2024) [42]	Germany	To examine the utilization and acceptance of WASH	RCT	276	Website and telephone	Psychiatrist and pediatrician	The intervention group (web-assisted self-help with and without telephone support) had high acceptance and utilization rates, with significant improvements in ADHD symptoms, including inattention and hyperactivity, as well as in parental stress and parenting practices

ADHD, attention deficit hyperactivity disorder; BPT, behavioral parent training; CATTS, children's ADHD telemental health treatment study; CRT, cluster randomized trial; DSM-IV, diagnostic and statistical manual of mental disorders, fourth edition; ED, emotion dysregulation; QbTest, computerized test of attention and activity; ODD, oppositional defiant disorder; QI, quality improvement; RCT, randomized controlled trial; RELAX, regulating emotions like an expert; RS-IV, rating scale-IV; TASH, telephone-assisted self-help; WASH, web-assisted self-help parent management training; WLC, waitlist control.

evaluated using a Virtual Care Value Framework [19]. This framework considers six aspects: (a) patient clinical outcomes, quality, and safety; (b) access to care; (c) patient, family, and caregiver experience; (d) clinician experience; (e) financial and operational impact; and (f) health equity. Studies were classified into these categories by examining their purpose, method, intervention, and results. Most studies focused on patients' clinical outcomes (19 studies), while other areas included access to care (4 studies), patient, family, and caregiver experiences (12 studies), clinician experience (2 studies), and financial and operational impact (5 studies). However, no study has examined health equity.

The reviewed studies on patient clinical outcomes, quality, and safety explored the impact of telehealth interventions in improving diagnostic accuracy, promoting treatment adherence, and alleviating ADHD symptoms. Research on access to care has primarily focused on evaluating attendance and participation rates. Studies on the experiences of patients, families, and caregivers have examined satisfaction, levels of engagement, and overall perceptions of telehealth services. Additionally, research on clinicians' experiences has assessed health professionals' behavior following educational programs and psychiatrists' adherence to evidence-based protocols when utilizing telehealth. Finally, studies on the financial and operational impacts have investigated the cost-effectiveness and key operational factors associated with telehealth implementation. Detailed information on the implementation of telehealth services in each study is presented in Table 3.

DISCUSSION

This scoping review analyzed the literature on telehealth implementation for children with ADHD. Using the Virtual Care Value framework, telehealth studies were assessed and categorized, providing a comprehensive overview of telehealth research in children with ADHD.

1. The Development of Telehealth Practice

The study revealed that majority of studies were conducted in the US, which has emerged as a pioneer in this field, as is evident from the work exemplified by Epstein's investigation into the use of internet portals to enhance care in community settings for children diagnosed with ADHD [45]. This trend aligns with a systematic review of telehealth implementation in neurodevelopmental disorders, which

Table 3. Classification of Studies According to Virtual Care Value Framework

Authors	Patient's clinical outcome, quality, and safety	Access to care	Patient, family, and caregiver experience	Clinician experience	Financial and operational impact	Health equity
Epstein et al. (2011) [45]	None	None	None	None	The effectiveness of a quality improvement program (operational)	None
Reese et al. (2012) [49]	Child behavior	None	Parents' distress	None	None	None
Xie et al. (2013) [38]	Parent ratings of ADHD, oppositional defiant disorder, and conduct disorder symptoms, and the children's global functioning	None	Parents' disciplinary practices	None	None	None
Myers et al. (2015) [24]	ADHD-related symptoms and behaviors, role performance, and functional impairment	None	None	None	None	None
Tse et al. (2015) [36]	Children's ADHD-related behaviors and functioning	Attendance to care	Caregivers' outcomes, specifically their distress, include measures of depression, stress, strain, and empowerment	None	None	None
Bai et al. (2015) [46]	Child ADHD symptoms, medication adherence	None	Parents' knowledge about ADHD, parents' satisfaction	None	None	None

(Continued to the next page)

Table 3. Continued

Authors	Patient's clinical outcome, quality, and safety	Access to care	Patient, family, and caregiver experience	Clinician experience	Financial and operational impact	Health equity
Rockhill et al. (2016) [44]	The attainment of the treat-to-target goal that is reducing ADHD-related symptoms	None	None	The decision-making process of telepsychiatrists in making medication changes for patients with ADHD	The fidelity of telepsychiatrists to evidence-based protocols in medication management	None
Corkum et al. (2016) [31]	Children's sleep and psychosocial functioning	None	Parents' satisfaction	None	None	None
Epstein et al. (2016) [33]	Parent- and teacher-rated ADHD symptoms	None	None	None	A quality improvement intervention that involves training sessions, office flow modification, and the use of an ADHD Internet portal	None
Franke et al. (2016) [34]	Mother-rated child hyperactivity/inattention, restlessness/impulsivity, defiance/aggression, social functioning, and teacher-rated prosocial behavior	None	Maternal over-reactivity, verbosity, laxness, positive parenting, parenting satisfaction, self-efficacy, stress, and depression	None	None	None
Dose et al. (2017) [32]	Functional impairment, ADHD symptoms, ODD symptoms	None	Parenting behavior, parental satisfaction	None	None	None
Fiks et al. (2017) [47]	None	None	None	The impact of web-based education, collaborative consultation, and performance feedback reports on clinician behaviour	The impact of an electronic health record-linked system on rating scale use and explores its potential role in improving care.	None
Vander Stoep et al. (2017) [37]	Child ADHD and ODD symptoms and role performance	None	Caregiver's distress	None	None	None
DuPaul et al. (2018) [43]	Child behavior (restlessness, impulsivity, improved self-control, affect, mood)	Attendance to care	Parent engagement and acceptability	None	None	None
Hollis et al. (2018) [35]	The speed and accuracy of diagnostic decision-making	None	None	None	The cost savings and efficiency	None
Weisman et al. (2018) [40]	Children or patient's experience or behavior in adherence	None	None	None	None	None
Dose et al. (2020) [30]	The severity of target problems, ADHD symptoms, and oppositional symptoms	ADHD	Parental satisfaction	None	None	None
Fried et al. (2020) [48]	Stimulant medication adherence	None	None	None	None	None

(Continued to the next page)

Table 3. Continued

Authors	Patient's clinical outcome, quality, and safety	Access to care	Patient, family, and caregiver experience	Clinician experience	Financial and operational impact	Health equity
Breaux et al. (2021) [50]	Adolescent's emotion dysregulation and communication	Attendance to care	Caregiver-adolescent conflict, caregiver emotion dysregulation	None	None	None
Kurokawa et al. (2024) [39]	Remote and face-to-face ADHD assessment	None	None	None	None	None
Paiva et al. (2024) [41]	ADHD symptoms, quality of life	None	Parenting style, parent's quality of life	None	None	None
Wähnke et al. 2024 [42]	None	Frequency and intensity of using WASH	None	None	None	None
Total	19	4	12	2	5	0

ADHD, attention deficit hyperactivity disorder; ODD, oppositional defiant disorder; WASH, web-assisted self-help parent management training.

showed that most studies were conducted in the US (64%), Asia (17%), and Europe (14%) [51]. Given that telehealth in the US has already been extensively used for various conditions such as cardiovascular disease [52], the application of this technology to ADHD management in the US is a logical progression. However, telehealth studies on the care of children with ADHD have also been conducted in countries such as Australia, Brazil, Canada, China, Israel, and the UK. Nonetheless, there remains a lack of studies conducted in other countries. This gap can be attributed to various factors, including variations in technological infrastructure, health-care systems, and government support for telehealth initiatives.

Additionally, excluding non-English articles may have contributed to this gap, as significant research in other languages may have been overlooked. An examination of telehealth implementation across Asia, Latin America, and Europe revealed a complex landscape of challenges including regulatory hurdles, technological limitations, resistance due to attitudes, ethical dilemmas, and geographic disparities, all of which significantly impede the rapid integration of telehealth [53]. This has resulted in a different pace of research on telehealth, particularly regarding its implementation in children with ADHD.

Notably, despite setting the search criteria from 2000 to 2024, the earliest article retrieved was published in 2011. Over the past decade, the reviewed studies have indicated a heightened level of research activity in telehealth for children with ADHD, with notable exceptions in 2014, 2019, 2021, and 2022. Although the onset of the COVID-19 pandemic might be expected to stimulate telehealth studies owing to the increased demand for remote healthcare services, it is interesting to note that no studies were published in 2021 and 2022. This delay may be attributed to barriers, such as logistical challenges, shifting research priorities, and publication delays.

Web portals and videoconferencing were used in 2011 and 2012, respectively. Although these technologies enable remote access and communication, privacy concerns have emerged [45]. With advances in telehealth, both devices and interventions have progressed. From 2015 to 2017, telehealth options expanded significantly, such as web-based interventions [33,34,46,47] and video teleconferencing [24,36,37,44]. This change signifies growing confidence in employing technology to support the care of children with ADHD. In 2018, the introduction of computerized tests and mobile applica-

tions advanced telehealth to a new level of ADHD assessment and management. These advances have enabled accurate diagnostic decision-making [35], facilitated symptom monitoring, and supported medication adherence [40]. Progress persisted until mid-2024 with studies incorporating text messaging, mobile applications, and web-based interventions in telehealth for ADHD management. Text messages and mobile applications have emerged as valuable tools for providing timely reminders [48], delivering educational content, and offering personalized support [30,34] and diagnostic purposes [39], resulting in increased patient engagement and improved adherence to treatment regimens.

In the reviewed studies, telehealth programs for children with ADHD emphasized parental education [24,30-32,34,36,38,41-43,46,49], behavioral therapy [30,50], support for medication adherence [40,46,48], quality improvement [33,45,47], diagnostic evaluations [35,39], and consultation [31]. These programs align with the comprehensive treatment approach for ADHD, which includes multimodal treatment, pharmacological interventions, and non-pharmacological strategies [54]. Ten reviewed studies on telehealth for children with ADHD have highlighted the importance of parental education, including psychoeducation, which is a multimodal treatment. Psychoeducation should be provided not only to individuals diagnosed with ADHD but also to their families and caregivers, aligning with established guidelines [54,55]. Ongoing telehealth-based education is essential because its effectiveness is comparable to face-to-face method [32,34,36,38,41-43,49]. Their results highlighted the importance of ongoing parental education during and after the pandemic. Regarding diagnostic assessment, one study utilized telehealth to administer a computerized test of attention and activity (QbTest) for diagnostic decision-making, which was found to be efficient in the ADHD assessment process [35]. Another study employed remote assessment, with results aligned with face-to-face evaluations, enabling the accurate identification of ADHD in children [39]. Further studies are required to validate the effectiveness of telehealth in diagnosing ADHD.

2. Telehealth Implementations According to Virtual Care Value Framework

A more comprehensive assessment of telehealth implementation in children with ADHD was conducted based on the AMA's virtual care value stream framework [19]. Patient

clinical outcomes, quality, and safety have emerged as prominent areas of investigation, with 19 studies examining these aspects. These studies explored the effectiveness of telehealth interventions in improving clinical outcomes, such as alleviating ADHD symptoms, promoting treatment adherence, and improving diagnostic accuracy. Studies on decision-making in diagnostics [35,39] are classified in this aspect, as they reduce the number of visits required for diagnosis correction [19]. Seven of these 19 studies showed similar or less favorable results from the intervention compared to the control groups [36,38-40], while the remaining studies demonstrated positive results. While the primary focus of a scoping review is not determining intervention efficacy [28], the positive outcomes observed in most of these studies suggest that telehealth could be a promising approach for managing children with ADHD. However, extensive research is warranted to validate these findings and establish definitive guidelines for telehealth interventions.

Four studies examined access to ADHD care services. The AMA defines access to care as an evaluation of a program's influence on the availability, suitability, and cost-effectiveness of care. This can be assessed by considering variables such as the average time patients travel to receive care, the availability of insurance coverage, and the percentage of individuals who stop seeking treatment because of various obstacles [19]. Four studies reported attendance and participation rates [36,42,43,50]. Wähnke et al. [42] indicated high utilization and acceptance of a web-assisted self-help program, whereas Tse et al. [36] showed comparable attendance between teletherapy and in-person sessions, with over 90% attendance in both groups. In addition to the need for further studies to validate these findings, research on the factors influencing the high patient attendance rate is crucial for reinforcing and enhancing these factors.

Patient, family, and caregiver experiences were addressed in 12 studies exploring the implementation of telehealth services for ADHD. These studies have explored the satisfaction, engagement, and overall experiences of families receiving telehealth services. This study focuses on the distress caused by clinical and technological experiences. Six studies examined parent satisfaction [30-32,38,46,50]. Parent satisfaction is pivotal because it describes the acceptability of telehealth interventions [56] in situations involving underserved families [49]. This satisfaction resonates with the broader benefits of telehealth such as improved convenience, reduced disruptions to daily routines, and increased engagement in

treatment [57]. Although quantitative studies provide valuable insights, qualitative research can provide a more comprehensive understanding of family experiences. For instance, a qualitative study in the US involving parents of children with developmental delays revealed barriers to access, Internet connectivity, and digital literacy [58]. Analogous qualitative studies in the context of ADHD could reveal the challenges that families encounter when utilizing telehealth services, thereby promoting the development of more effective solutions. Consequently, further qualitative research that focuses on the acceptance of telehealth and its perceived benefits is imperative.

Regarding clinician experience, two studies examined this aspect in the context of telehealth for ADHD [44,47]. These studies investigated health professionals' behavior in post-education programs and psychiatrists' fidelity in using evidence-based protocols with telehealth. The sub-streams of clinician experience include technology and work experience [19]. Clinicians' experiences with telehealth are mixed, with telepsychiatrists demonstrating effectiveness and competence [44], while other interventions indicate the need for additional support and engagement strategies [47]. With only two studies, more research is needed to identify the experiences of healthcare professionals. Health professionals are expected to be competent in telehealth because of its quality and security [59].

Five studies explored the financial and operational effects of telehealth services. These studies assessed cost-effectiveness [35] and operational considerations associated with the implementation of telehealth services for ADHD [33,44,45,47]. They provide insights into the potential financial savings, quality improvements, and workflow modifications resulting from telehealth adoption in ADHD care. Notably, one study in this scoping review reported "cost neutral" implying that providing the QbTest report within the trial neither significantly increased nor decreased the overall cost of the health services [35]. However, this finding necessitates further analysis, as other studies have reported cost savings attributed to telehealth [60], citing per-visit savings ranging from \$141.1 to \$222.8, depending on the visit type and the model utilized [61]. According to a scoping review that compared the costs of telehealth and the healthcare system, telehealth may reduce costs by eliminating the need for patient travel and costly procedures while providing effective remote care. Furthermore, it enables healthcare providers to deliver efficient and high-quality care, thereby reducing

overall expenses [62]. Limited research on cost and operational impacts, coupled with contradictory findings, necessitates further investigation and validation. Such an exploration is crucial for establishing clear guidelines on the cost-effectiveness of telehealth in ADHD care, potentially informing policies and service delivery improvements.

In this scoping review, no study explicitly examined health equity within the context of telehealth among children with ADHD. Health equity is defined as having the conditions, resources, opportunities, and agencies needed to achieve optimal health. This implies the need to examine health equity across all five aspects of the AMA framework. Although no study has specifically addressed this aspect, the inherent characteristics of telehealth include health equity. This is particularly evident in a study focusing on underserved populations [49], in which telehealth interventions have the potential to bridge healthcare gaps and ensure equitable care delivery. Therefore, a more thorough examination is required to fully understand and quantify the impact of telehealth on health equity in children with ADHD.

According to the results of this study, the Virtual Care Value Framework is a suitable tool for analyzing the telehealth environment of children with ADHD. This framework comprehensively organizes a review of the key elements. For example, the framework's focus on patients' clinical outcomes, access to care, and patients' and caregivers' experiences allowed for a structured evaluation of how telehealth interventions improved ADHD symptoms, increased treatment adherence, and ensured high levels of family satisfaction. This structured approach highlights the strengths of telehealth and identifies areas in which further research is required, thereby making the review more comprehensive and focused.

3. Nursing Implications

This scoping review has important implications for both research and clinical practice. The geographic disparity in telehealth research and implementation for children with ADHD necessitates extensive research in countries other than the US, where the pace of telehealth development may be hindered by challenges such as regulatory, technological, and provisional issues. Additionally, as evidenced by the growing variety of telehealth devices and interventions, the evolution of telehealth technologies suggests a need for research on using new and current technologies in ADHD

treatment. As telehealth technologies advance, the skills and competencies of healthcare professionals, including nurses, also evolve. Consequently, research focusing on the development and implementation of telehealth training programs is imperative to ensure that healthcare professionals possess the skills required to provide effective telehealth care. Future telehealth research should focus on treatments for ADHD, including multimodal, pharmacological, and non-pharmacological approaches. This entails evaluating how telehealth platforms can be modified to improve adherence to these treatments, enhance parental education, and effectively deliver non-pharmacological interventions, such as psychoeducation and cognitive behavioral therapies. A deeper understanding of the patients', families', and caregivers' experiences is needed, particularly through qualitative studies. The mixed results of the clinician experience studies highlight the need for further confirmation. Additionally, more research is required to investigate and validate the cost and operational impacts, given the limited and contradictory findings of existing studies. Future studies should also aim to comprehensively cover the Virtual Care Value Framework, particularly the health-equity component, which has not yet been examined.

The results of this study have significant implications for clinical practice. Initially, the findings emphasized the essential function of nurses, who play a vital role in recognizing, intervening, and providing continuous support for children with ADHD. Furthermore, the findings of the ADHD interventions offer guidance for clinical settings. By incorporating evidence-based ADHD interventions, healthcare providers can enhance the care and support offered to children with ADHD. Implementing these interventions as part of regular practice enables nurses to effectively address the complex needs of vulnerable children, resulting in improved general health and developmental outcomes. It is essential for clinicians to engage in ongoing research and education on ADHD interventions to establish a comprehensive and effective approach to pediatric care.

4. Strengths and Limitations

To the best of our knowledge, this study is the first to map the landscape of telehealth research in children with ADHD and evaluate existing research gaps using a virtual care value stream framework. These findings provide a strong foundation for future research in this field. However, this study had

some limitations. The exclusion of non-English literature may introduce a language bias, thereby potentially overlooking valuable research conducted in other languages. Additionally, the specific terms used for telehealth in this study may have excluded relevant studies using different terminologies.

CONCLUSION

This scoping review provides an extensive overview of telehealth research on children with ADHD. Utilizing the virtual care value stream framework, the findings emphasized the predominance of telehealth research in the US, underscoring the need for global representation. Furthermore, it highlights the potential of telehealth technologies to improve ADHD assessment, enhance treatment adherence, and enrich parental education. Future research should focus on health equity and other unexplored aspects of the Virtual Care Value Framework of the AMA. These efforts will enhance our understanding of the effectiveness of telehealth and inform the development of treatment guidelines and policies for ADHD.

ARTICLE INFORMATION

Authors' contribution

Conceptualization: Dian Susmarini, Hyewon Shin; Data collection, Formal analysis: all authors; Writing-original draft: all authors; Writing-review and editing: all authors; Final approval of published version: all authors.

Conflict of interest

No existing or potential conflict of interest relevant to this article was reported.

Funding

None.

Data availability

Please contact the corresponding author for data availability.

Acknowledgements

None.

ORCID and ResearcherID

Dian Susmarini <https://orcid.org/0000-0001-9976-7890>
<https://researcherid.com/rid/JWA-2846-2024>
Hyewon Shin <https://orcid.org/0000-0003-1831-3710>
<https://researcherid.com/rid/ITU-5631-2023>
Sunyeob Choi <https://orcid.org/0000-0001-9879-2947>
<https://researcherid.com/rid/IIT-9426-2023>

REFERENCES

1. Donoghue EA, Kraft CA. Managing chronic health needs in child care and schools. 2nd ed. American Academy of Pediatrics; 2019. p. 281.
2. Price A, Mitchell S, Janssens A, Eke H, Ford T, Newlove-Delgado T. In transition with attention deficit hyperactivity disorder (ADHD): children's services clinicians' perspectives on the role of information in healthcare transitions for young people with ADHD. *BMC Psychiatry*. 2022;22(1):251. <https://doi.org/10.1186/s12888-022-03813-6>
3. Hohman JA, Martinez KA, Anand A, Martyn T, Rood M, Rothberg MB. Use of direct-to-consumer telemedicine for attention-deficit hyperactivity disorder. *Journal of General Internal Medicine*. 2020;35(11):3392-3394. <https://doi.org/10.1007/s11606-020-05891-2>
4. Young S, Asherson P, Lloyd T, Absoud M, Arif M, Colley WA, et al. Failure of healthcare provision for attention-deficit/hyperactivity disorder in the United Kingdom: a consensus statement. *Frontiers in Psychiatry*. 2021;12:649399. <https://doi.org/10.3389/fpsy.2021.649399>
5. Spencer T, Noyes E, Biederman J. Telemedicine in the management of ADHD: literature review of telemedicine in ADHD. *Journal of Attention Disorders*. 2020;24(1):3-9. <https://doi.org/10.1177/1087054719859081>
6. Lakhan SE, Kirchgessner A. Prescription stimulants in individuals with and without attention deficit hyperactivity disorder: misuse, cognitive impact, and adverse effects. *Brain and Behavior*. 2012;2(5):661-677. <https://doi.org/10.1002/brb3.78>
7. Bozinovic K, McLamb F, O'Connell K, Olander N, Feng Z, Haagenzen S, et al. U.S. national, regional, and state-specific socioeconomic factors correlate with child and adolescent ADHD diagnoses pre-COVID-19 pandemic. *Scientific Reports*. 2021;11(1): 22008. <https://doi.org/10.1038/s41598-021-01233-2>
8. McIntyre LL, Neece CL, Sanner CM, Rodriguez G, Safer-Lichtenstein J. Telehealth delivery of a behavioral parent training program to Spanish-speaking Latinx parents of young children with developmental delay: applying an implementation framework approach. *School Psychology Review*. 2021;51(2):206-220. <https://doi.org/10.1080/2372966X.2021.1902749>
9. Hu N, Nassar N, Shrapnel J, Perkes I, Hodgins M, O'Leary F, et al. The impact of the COVID-19 pandemic on paediatric health service use within one year after the first pandemic outbreak in New South Wales Australia - a time series analysis. *Lancet Regional Health Western Pacific*. 2022;19:100311. <https://doi.org/10.1016/j.lanwpc.2021.100311>
10. McLoone J, Wakefield CE, Marshall GM, Pierce K, Jaffe A, Bye A, et al. It's made a really hard situation even more difficult: the impact of COVID-19 on families of children with chronic illness. *PLoS One*. 2022;17(9):e0273622. <https://doi.org/10.1371/journal.pone.0273622>
11. Rametta SC, Fridinger SE, Gonzalez AK, Xian J, Galer PD, Kaufman M, et al. Analyzing 2,589 child neurology telehealth encounters necessitated by the COVID-19 pandemic. *Neurology*. 2020;95(9): e1257-e1266. <https://doi.org/10.1212/wnl.00000000000010010>
12. Kichloo A, Albosta M, Dettloff K, Wani F, El-Amir Z, Singh J, et al. Telemedicine, the current COVID-19 pandemic and the future: a narrative review and perspectives moving forward in the USA. *Family Medicine and Community Health*. 2020;8(3):e000530. <https://doi.org/10.1136/fmch-2020-000530>
13. Gallegos C, Aldridge MD, Connor K, Zuba L. Parenting a child with a chronic illness during a pandemic. *Journal of Pediatric Nursing*. 2022;66:64-69. <https://doi.org/10.1016/j.pedn.2022.05.009>
14. Hyder MA, Razzak J. Telemedicine in the United States: an introduction for students and residents. *Journal of Medical Internet Research*. 2020;22(11):e20839. <https://doi.org/10.2196/20839>
15. Schweiberger K, Hoberman A, Iagnemma J, Schoemer P, Squire J, Taormina J, et al. Practice-level variation in telemedicine use in a pediatric primary care network during the COVID-19 pandemic: retrospective analysis and survey study. *Journal of Medical Internet Research*. 2020;22(12):e24345. <https://doi.org/10.2196/24345>
16. Alonso SG, Marques G, Barrachina I, Garcia-Zapirain B, Arambarri J, Salvador JC, et al. Telemedicine and e-Health research solutions in literature for combatting COVID-19: a systematic review. *Health and Technology*. 2021;11(2):257-266. <https://doi.org/10.1007/s12553-021-00529-7>
17. Adabla S, Nabors L, Hamblin K. A scoping review of virtual reality interventions for youth with attention-deficit/hyperactivity disorder. *Advances in Neurodevelopmental Disorders*. 2021;5(3):304-315. <https://doi.org/10.1007/s41252-021-00207-9>
18. Kokol P, Vošner HB, Završnik J, Vermeulen J, Shohieb S, Peine-

- mann F. Serious game-based intervention for children with developmental disabilities. *Current Pediatric Reviews*. 2020;16(1):26-32. <https://doi.org/10.2174/1573396315666190808115238>
19. American Medical Association (AMA). Return on health: moving beyond dollars and cents in realizing the value of virtual care [Internet]. 2021 [cited 2024 March 1st]. Available from: <https://www.ama-assn.org/system/files/2021-05/ama-return-on-health-report-may-2021.pdf>
 20. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology: Theory & Practice*. 2005;8(1):19-32. <https://doi.org/10.1080/1364557032000119616>
 21. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Annals of Internal Medicine*. 2018;169(7):467-473. <https://doi.org/10.7326/m18-0850>
 22. Mak S, Thomas A. Steps for conducting a scoping review. *Journal of Graduate Medical Education*. 2022;14(5):565-567. <https://doi.org/10.4300/jgme-d-22-00621.1>
 23. Chan E. Improving engagement in ADHD care. *Pediatrics*. 2021; 148(2):e2021050766. <https://doi.org/10.1542/peds.2021-050766>
 24. Myers K, Vander Stoep A, Zhou C, McCarty CA, Katon W. Effectiveness of a telehealth service delivery model for treating attention-deficit/hyperactivity disorder: a community-based randomized controlled trial. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2015;54(4):263-274. <https://doi.org/10.1016/j.jaac.2015.01.009>
 25. Sehlin H, Hedman Ahlström B, Andersson G, Wentz E. Experiences of an internet-based support and coaching model for adolescents and young adults with ADHD and autism spectrum disorder - a qualitative study. *BMC Psychiatry*. 2018;18(1):15. <https://doi.org/10.1186/s12888-018-1599-9>
 26. Shah R, Chakrabarti S, Sharma A, Grover S, Sachdeva D, Avasthi A. Participating from homes and offices: proof-of-concept study of multi-point videoconferencing to deliver group parent training intervention for attention-deficit/ hyperactivity disorder. *Asian Journal of Psychiatry*. 2019;41:20-22. <https://doi.org/10.1016/j.ajp.2019.03.006>
 27. Khan K, Hall CL, Davies EB, Hollis C, Glazebrook C. The effectiveness of web-based interventions delivered to children and young people with neurodevelopmental disorders: systematic review and meta-analysis. *Journal of Medical Internet Research*. 2019;21(11): e13478. <https://doi.org/10.2196/13478>
 28. Pollock D, Davies EL, Peters MDJ, Tricco AC, Alexander L, McInerney P, et al. Undertaking a scoping review: a practical guide for nursing and midwifery students, clinicians, researchers, and academics. *Journal of Advanced Nursing*. 2021;77(4): 2102-2113. <https://doi.org/10.1111/jan.14743>
 29. Oermann MH, Wrigley J, Nicoll LH, Ledbetter LS, Carter-Templeton H, Edie AH. Integrity of Databases for Literature Searches in Nursing: Avoiding Predatory Journals. *Advances in Nursing Science*. 2021;44(2):102-110. <https://doi.org/10.1097/ans.0000000000000349>
 30. Dose C, Waschau F, von Wirth E, Döpfner M. The improvement of individually defined problem behaviors during a telephone-assisted self-help intervention for parents of pharmacologically treated children with ADHD. *Zeitschrift für Kinder- und Jugendpsychiatrie und Psychotherapie*. 2020;48(3):215-223. <https://doi.org/10.1024/1422-4917/a000726>
 31. Corkum P, Lingley-Pottie P, Davidson F, McGrath P, Chambers CT, Mullane J, et al. Better nights/better days-distance intervention for insomnia in school-aged children with/without ADHD: a randomized controlled trial. *Journal of Pediatric Psychology*. 2016;41(6):701-713. <https://doi.org/10.1093/jpepsy/jsw031>
 32. Dose C, Hautmann C, Buerger M, Schuermann S, Woitecki K, Döpfner M. Telephone-assisted self-help for parents of children with attention-deficit/hyperactivity disorder who have residual functional impairment despite methylphenidate treatment: a randomized controlled trial. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*. 2017;58(6):682-690. <https://doi.org/10.1111/jcpp.12661>
 33. Epstein JN, Kelleher KJ, Baum R, Brinkman WB, Peugh J, Gardner W, et al. Impact of a web-portal intervention on community ADHD care and outcomes. *Pediatrics*. 2016;138(2):e20154240. <https://doi.org/10.1542/peds.2015-4240>
 34. Franke N, Keown LJ, Sanders MR. An RCT of an online parenting program for parents of preschool-aged children with ADHD symptoms. *Journal of Attention Disorders*. 2020;24(12):1716-1726. <https://doi.org/10.1177/1087054716667598>
 35. ; the AQUA Trial Group. The impact of a computerised test of attention and activity (QbTest) on diagnostic decision-making in children and young people with suspected attention deficit hyperactivity disorder: single-blind randomised controlled trial. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*. 2018;59(12):1298-1308. <https://doi.org/10.1111/jcpp.12921>
 36. Tse YJ, McCarty CA, Stoep AV, Myers KM. Teletherapy delivery of caregiver behavior training for children with attention-deficit hyperactivity disorder. *Telemedicine Journal and e-Health*. 2015;21(6): 451-458. <https://doi.org/10.1089/tmj.2014.0132>
 37. Vander Stoep A, McCarty CA, Zhou C, Rockhill CM, Schoenfelder EN, Myers K. The children's attention-deficit hyperactivity disorder telemental health treatment study: caregiver outcomes. *Journal of*

- Abnormal Child Psychology. 2017;45(1):27-43. <https://doi.org/10.1007/s10802-016-0155-7>
38. Xie Y, Dixon JF, Yee OM, Zhang J, Chen YA, Deangelo S, et al. A study on the effectiveness of videoconferencing on teaching parent training skills to parents of children with ADHD. *Telemedicine Journal and e-Health*. 2013;19(3):192-199. <https://doi.org/10.1089/tmj.2012.0108>
39. Kurokawa S, Nomura K, Hosogane N, Nagasawa T, Kawade Y, Matsumoto Y, et al. Reliability of telepsychiatry assessments using the attention-deficit/hyperactivity disorder rating scale-IV for children with neurodevelopmental disorders and their caregivers: randomized feasibility study. *Journal of Medical Internet Research*. 2024;26:e51749. <https://doi.org/10.2196/51749>
40. Weisman O, Schonherz Y, Harel T, Efron M, Elazar M, Gothelf D. Testing the efficacy of a smartphone application in improving medication adherence, among children with ADHD. *Israel Journal of Psychiatry*. 2018;55(2):59-64,67.
41. Paiva GCC, de Paula JJ, Costa DS, Alvim-Soares A, Santos DAFE, Jales JS, et al. Parent training for disruptive behavior symptoms in attention deficit hyperactivity disorder: a randomized clinical trial. *Frontiers in Psychology*. 2024;15:1293244. <https://doi.org/10.3389/fpsyg.2024.1293244>
42. Wähnke L, Plüick J, Bodden M, Ernst A, Klemp MT, Mühlenmeister J, et al. Acceptance and utilization of web-based self-help for caregivers of children with externalizing disorders. *Child and Adolescent Psychiatry and Mental Health*. 2024;18(1):40. <https://doi.org/10.1186/s13034-024-00724-0>
43. DuPaul GJ, Kern L, Belk G, Custer B, Daffner M, Hatfield A, et al. Face-to-face versus online behavioral parent training for young children at risk for ADHD: treatment engagement and outcomes. *Journal of Clinical Child and Adolescent Psychology*. 2018;47(Suppl 1):S369-S383. <https://doi.org/10.1080/15374416.2017.1342544>
44. Rockhill CM, Tse YJ, Fesinmeyer MD, Garcia J, Myers K. Telepsychiatrists' medication treatment strategies in the children's attention-deficit/hyperactivity disorder telemental health treatment study. *Journal of Child and Adolescent Psychopharmacology*. 2016;26(8):662-671. <https://doi.org/10.1089/cap.2015.0017>
45. Epstein JN, Langberg JM, Lichtenstein PK, Kolb R, Altaye M, Simon JO. Use of an Internet portal to improve community-based pediatric ADHD care: a cluster randomized trial. *Pediatrics*. 2011;128(5):e1201-e1208. <https://doi.org/10.1542/peds.2011-0872>
46. Bai GN, Wang YF, Yang L, Niu WY. Effectiveness of a focused, brief psychoeducation program for parents of ADHD children: improvement of medication adherence and symptoms. *Neuropsychiatric Disease and Treatment*. 2015;11:2721-2735. <https://doi.org/10.2147/ndt.s88625>
47. Fiks AG, Mayne SL, Michel JJ, Miller J, Abraham M, Suh A, et al. Distance-learning, ADHD quality improvement in primary care: a cluster-randomized trial. *Journal of Developmental and Behavioral Pediatrics*. 2017;38(8):573-583. <https://doi.org/10.1097/dbp.0000000000000490>
48. Fried R, DiSalvo M, Kelberman C, Adler A, McCafferty D, Woodworth KY, et al. An innovative SMS intervention to improve adherence to stimulants in children with ADHD: preliminary findings. *Journal of Psychopharmacology*. 2020;34(8):883-890. <https://doi.org/10.1177/0269881120908014>
49. Reese RJ, Slone NC, Soares N, Sprang R. Telehealth for underserved families: an evidence-based parenting program. *Psychological Services*. 2012;9(3):320-322. <https://doi.org/10.1037/a0026193>
50. Breaux R, Shroff DM, Cash AR, Swanson CS, Carlton C, Bertollo JR, et al. Telehealth delivery of the RELAX intervention for families of adolescents diagnosed with ADHD: preliminary treatment outcomes and evidence of acceptability and feasibility. *Evidence-Based Practice in Child and Adolescent Mental Health*. 2021;8(1):24-38. <https://doi.org/10.1080/23794925.2021.1970053>
51. Valentine AZ, Hall SS, Young E, Brown BJ, Groom MJ, Hollis C, et al. Implementation of telehealth services to assess, monitor, and treat neurodevelopmental disorders: systematic review. *Journal of Medical Internet Research*. 2021;23(1):e22619. <https://doi.org/10.2196/22619>
52. Lee JS, Lowe Beasley K, Schooley MW, Luo F. Trends and costs of US telehealth use among patients with cardiovascular disease before and during the COVID-19 pandemic. *Journal of the American Heart Association*. 2023;12(4):e028713. <https://doi.org/10.1161/jaha.122.028713>
53. Gupta A, Dogar ME, Sijin Zhai E, Singla P, Shahid T, Yildirim HN, et al. Innovative telemedicine approaches in different countries: opportunity for adoption, leveraging, and scaling-up. *Telehealth and Medicine Today*. 2020;5(1):https://doi.org/10.30953/tmt.v5.160
54. Drechsler R, Brem S, Brandeis D, Grünblatt E, Berger G, Walitza S. ADHD: current concepts and treatments in children and adolescents. *Neuropediatrics*. 2020;51(5):315-335. <https://doi.org/10.1055/s-0040-1701658>
55. Powell LA, Parker J, Weighall A, Harpin V. Psychoeducation intervention effectiveness to improve social skills in young people with ADHD: a meta-analysis. *Journal of Attention Disorders*. 2022;26(3):340-357. <https://doi.org/10.1177/1087054721997553>
56. Clemmons NG, Coates E, McLeod A. Understanding the benefits of child-parent psychotherapy delivered via telehealth during the COVID-19 pandemic. *Children's Health Care*. 2023;53(1):41-59. <https://doi.org/10.1080/02739615.2023.2179489>
57. Substance Abuse and Mental Health Services Administration

- (SAMHSA). Telehealth for the treatment of serious mental illness and substance use disorders. SAMHSA Publication No. PEP21-06-02-001 [Internet]. 2021 [cited 2023 Jun 16]. Available from: <http://store.samhsa.gov>
58. Cheung WC, Aleman-Tovar J, Johnston AN, Little LM, Burke MM. A qualitative study exploring parental perceptions of telehealth in early intervention. *Journal of Developmental and Physical Disabilities*. 2023;35(3):353-373. <https://doi.org/10.1007/s10882-022-09853-w>
59. Jonasdottir SK, Thordardottir I, Jonsdottir T. Health professionals' perspective towards challenges and opportunities of telehealth service provision: a scoping review. *International Journal of Medical Informatics*. 2022;167:104862. <https://doi.org/10.1016/j.ijmedinf.2022.104862>
60. Salsabilla A, Azzahra AB, Syafitri RIP, Supadmi W, Suwantika AA. Cost-effectiveness of telemedicine in Asia: a scoping review. *Journal of Multidisciplinary Healthcare*. 2021;14:3587-3596. <https://doi.org/10.2147/jmdh.s332579>
61. Patel KB, Turner K, Alishahi Tabriz A, Gonzalez BD, Oswald LB, Nguyen OT, et al. Estimated indirect cost savings of using telehealth among nonelderly patients with cancer. *JAMA Network Open*. 2023;6(1):e2250211. <https://doi.org/10.1001/jamanetworkopen.2022.50211>
62. Snoswell CL, Taylor ML, Comans TA, Smith AC, Gray LC, Caffery LJ. Determining if telehealth can reduce health system costs: scoping review. *Journal of Medical Internet Research*. 2020;22(10):e17298. <https://doi.org/10.2196/17298>