English

Telerehabilitation and telephysiotherapy in children and adolescents with respiratory diseases: an integrative review

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Abstract

Introduction: Telehealth consists of health services or interventions that use virtual technology or telecommunication. This type of care in the pediatric population with chronic respiratory diseases can be used as an adjunct to conventional treatment. Objective: to describe the effects of telehealth interventions on the outcomes of pulmonary function, exercise capacity, quality of life, frequency of exacerbations and hospital admissions of children and adolescents with respiratory diseases. Method: a systematic review was conducted by searching articles in the databases of PubMed, Cochrane Library, Scopus, Web of Science, PeDro and Google Scholar, using the descriptors in the PICOS model and based on the Health Sciences Descriptors (DeCS) and Medical Subject Headings (MeSH). Inclusion criteria: the outcomes of pulmonary function, exercise capacity, quality of life, frequency of exacerbations and hospital admissions after telehealth interventions applied to the pediatric population with chronic respiratory diseases were considered. Results: a total of 2344 article titles were identified. Respecting the inclusion, exclusion and duplication criteria, at the end of the selection, 17 articles were considered. Conclusion: telehealth actions are beneficial for the control of chronic respiratory diseases in pediatrics and can be used as alternative or supportive interventions to conventional face-to-face treatment.

Keywords: Telerehabilitation; Physiotherapy; Children; Respiratory Disease.

Resumen

Telerehabilitación y telefisioterapia en niños y adolescentes con enfermedades respiratorias: revisión integrativa.

Introducción: La telesalud consiste en servicios o intervenciones de salud que utilizan tecnología virtual o telecomunicaciones. Este tipo de atención en la población pediátrica con enfermedades respiratorias crónicas puede utilizarse como complemento al tratamiento convencional. Objetivo: describir los efectos de las intervenciones de telesalud en los resultados de función pulmonar, capacidad de ejercicio, calidad de vida, frecuencia de exacerbaciones e ingresos hospitalarios de niños y adolescentes con enfermedades respiratorias. Método: se realize una revision integrativa mediante la búsqueda de artículos en las bases de datos de PubMed, Cochrane Library, Scopus, Web of Science, PeDro y Google Scholar, utilizando los discriptores en el enfoque PICOS y con base en los Descriptores en Ciencias de la Salud (DeCS) y Medical Subject Headings (MeSH). Se consideraron criterios de inclusion: función pulmonar, capacidad de ejercicio, calidad de vida, frecuencia de exacerbaciones de telesalud aplicadas a la población pediátrica con enfermidades respiratorias crónicas. Resultados: se identificaron un total de 2344 títulos de artículos. Respetando los criterios de inclusion, exclusion y duplicidad, al final de la selección fueron considerados 17 artículos. Conclusón: las acciones de telesalud son beneficiosas para el control de las enfermedades respiratorias crónicas en pediatría y pueden ser utilizadas como intervenciones alternativas o coadyuvantes al tratamiento presencial convencional.

Palabras clave: Telerehabilitación; Fisioterapia; Niños; Enfermedades Respiratorias.

Resumo

Telereabilitação e telefisioterapia em crianças e adolescentes com doenças respiratórias: revisão integrativa.

Introdução: Telessaúde consiste em serviços ou intervenções de saúde que utilizam tecnologia virtual ou telecomunicação. Este tipo de atendimento na população pediátrica com doenças respiratórias crônicas pode ser utilizado como coadjuvante ao tratamento convencional. Objetivo: descrever os efeitos das intervenções de telessaúde nos desfechos de função pulmonar, capacidade de exercício, qualidade de vida, frequência de exacerbações e internações hospitalares de crianças e adolescentes com doenças respiratórias. Método: conduziu-se uma revisão integrativa por meio de pesquisa de artigos nas bases de PubMed, Cochrane Library, Scopus, Web of Science, PeDro e Google Scholar, utilizando-se os descritores na abordagem PICOS e baseados nos Descritores em Ciências da Saúde (DeCS) e Medical Subject Headings (MeSH). Critérios de inclusão: foram considerados os desfechos de função pulmonar, capacidade de exercício, qualidade de vida, frequência de exacerbações e internações hospitalares após intervenções de telessaúde aplicadas à população pediátrica com doenças respiratórias crônicas. Resultados: foram identificados um total de 2344 títulos de artigos. Respeitando-se os critérios de inclusão, exclusão e as duplicidades, ao final da seleção, foram considerados 17 artigos. Conclusão: ações de telessaúde são benéficas para o controle de doenças respiratórias crônicas da pediatria e podem ser utilizadas como intervenções alternativas ou coadjuvantes ao tratamento presencial convencional.

Palavras-chave: Telereabilitação; Fisioterapia; Crianças; Doenças Respiratórias.

Introduction

Telehealth consists of health services or interventions that use virtual technology or telecommunication such as cell phones, monitoring applications, and/or personal digital assistants[1]. Remote communication between patients and health professionals can be performed via telephone (through calls or text messages), e-mail, videoconferencing, applications, and interactive games[2,3]. One of the domains of telehealth is telerehabilitation or telephysiotherapy, which is a modality of physiotherapeutic care that includes consultation, assessment, intervention, monitoring, prevention, supervision, and education[4–6].

This type of care is a strategy to provide access to health services for geographically distant individuals, patients with comorbidities that make mobility difficult, and in situations that require social distancing, such as the Covid-19 pandemic scenario[1,5–7].

In the pediatric population, telehealth strategies are interesting to promote physical activity, improve treatment adherence, assist in disease management and avoid complications[3]. In addition, they are also used as primary care actions in schools and daycare centers, promoting health promotion and disease prevention[8].

In pediatric respiratory diseases specifically, such as cystic fibrosis (CF) and asthma, technological devices can be an adjunct to conventional treatment to assist in the practice of home exercises, control symptoms, and prevent exacerbations[9,10], in addition to being used as therapeutic resources in situations where face-to-face rehabilitation is impossible[11].

In this sense, there is a range of studies that prove the effectiveness and applicability of telerehabilitation/telephysiotherapy in adults with chronic cardiopulmonary diseases[7,12–14], as well as telemonitoring in adults with CF[15] and in children with asthma and CF[16,17] as a strategy to prevent exacerbations and improve disease management. However, little is known about the effects of telehealth strategies involving telerehabilitation and/or health education through technological devices in children and adolescents with respiratory diseases. Therefore, this review aims to describe the effects of telehealth interventions on pulmonary function outcomes, exercise capacity, quality of life (QoL), disease control and knowledge, treatment adherence and hospital admissions of children and adolescents with respiratory disease.

Method

Protocol and registration

All article selection steps were performed following the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyzes (PRISMA)[18]. The study protocol was registered on the International Prospective Register of Systematic Reviews (PROSPERO) platform under number CRD42021253117.

Eligibility Criteria

We included randomized clinical trials and cross-sectional studies that evaluated the effect of telehealth interventions in the pediatric population through one or more of the considered outcomes. We included the pediatric population in general (up to 18 years old), the period of publication and language of the articles were not specified.

The following exclusion criteria were adopted: (1) integrative reviews and meta-analysis; (2) studies that evaluated adults exclusively and studies with a sample of adults and children that did not present data for the

pediatric age group separately; (3) studies that evaluated populations affected by diseases other than the respiratory system; (4) studies that evaluated populations affected by acute respiratory diseases requiring hospitalization; (5) studies that evaluated only the medication adherence outcome; (6) studies that evaluated usability/feasibility; (7) protocols without outcome evaluation; (8) telemonitoring only (no intervention).

Information sources and search strategies

Search strategies were developed individually for each of the following databases: PubMed, Cochrane Library, Scopus, Web of Science, and PeDro. In addition, an additional search of the gray literature was performed through Google Scholar. The search strategy was focused on the PICOS approach, Population (example: children and adolescents), Intervention (example: telerehabilitation and/or telehealth), "Outcomes" (example: quality of life/pulmonary function/disease control and hospitalizations hospitals). The selection of descriptors was based on the Health Science Descriptors (DeCS) and Medical Subject Headings (MeSH). The literature search was performed in November 2020. We used reference management software (EndNote®) to collect references and exclude duplicates.

Selection of studies

The selection of studies was performed by two independent authors, respecting the inclusion and exclusion criteria of the articles. Any disagreement was resolved by the third author (TC). First, studies with titles compatible with the theme were selected and then the respective abstracts were analyzed. Subsequently, the articles with the selected abstracts were obtained for reading in full. Finally, we included articles compatible with the inclusion criteria for this review.

Manual searches were carried out in the reference list of the included studies to identify new titles, characterized by convenience sampling, to guarantee a thorough review process. These new titles underwent the same procedure.

Data extraction process

For the data extraction process, an original form was used to record the necessary information from the selected studies. One reviewer collected the information independently (SF). The collected data supported the preparation of Table 1.

Table 1: Data extraction

Reference	Age	Objective	CG	IG	Time	Outcome	Sample	Results
Chan et al, 2007	6-17	To compare telemonitoring with face-to-face consultations	Outpatient treatment with 6 visits. At each visit, patients and their parents received face-to-face education about asthma. Telephone contact 2x/week for 6 weeks and then 1x/week to review management plans and remind patient to complete symptom diary information and record peak flow measurements	There were 3 face-to-face visits and 3 virtual visits that included asthma education, a video recording of the peak flow meter and inhaler use referred to the website, and completion of the asthma symptom diary. Videos were uploaded 2x/week for 6 weeks and then 1x/week. Email contact was 2x/week for 6 weeks and then 1x/week to review management plans and remind patient to complete symptom diary information and record peak flow measurements	52 weeks	Adherence measures, disease control measures, QOL	CG: 55 and IG: 47	Both groups had excellent therapeutic adherence. IG patients adhered more to sending symptom diaries (consequently more symptom-free days) and had better inhaler scores. No difference between groups in disease control. No difference between groups in lung function. Knowledge about the disease improved in both groups. There were no changes in QOL in both groups

Reference	Age	Objective	CG	IG	Time	Outcome	Sample	Results
Gustafson et al, 2012	4-12	To test the effects of a virtual system on children with poorly controlled asthma	Usual treatment and information about asthma	Information on game and audiovisual formats and social support through peer group discussion and personal stories. Monthly call to assess asthma, medication adherence, and psychosocial challenges. Parents received asthma education, intergroup discussion, case manager email, and wellness assessment	1 year	Adherence measures, disease control measures, social support, and self-efficacy	CG: 127 and IG: 132	GI had greater asthma control when compared to the control group and an increase in symptom-free days, but with no significant difference from the control group. Medication adherence measures did not change significantly within or between groups.
Jan et al, 2007	6-12	To compare an educational program + internet-based monitoring with a traditional educational program	Written symptom diary and electronic peak flow meter, asthma education with verbal and printed information	Interactive web-based educational and monitoring program with basic information about the care of the asthmatic child, electronic diary, patient action plan, and analysis system with computer/physician instructions. Participants received an electronic peak flow meter and were taught to monitor peak expiratory flow and FEV1	12 weeks	Adherence measures, disease control measures, QOL, and knowledge about the disease	CG: 76 and IG: 88	IG had a reduction in nocturnal and diurnal symptoms, improvement in QOL, and greater adherence to the daily medication record. Both groups improved their knowledge about the disease, greater in the intervention group. Both groups improved morning and evening PEF after 12 weeks, with no significant difference between them.
Perry et al, 2018	7-14	To test a school-based educational program via telemedicine	Medical care as usual	There were 5 telemedicine education sessions for the child, their parents, and the school nurse including information on anatomy, symptoms, medication, and action plan. Monitoring of symptoms and lung function for 6 months via the school website	1 school year	Days without symptoms, a measure of functional health, QOL, knowledge about the disease, and self-efficacy	CG: 183 and IG: 180	There was no significant difference in symptom-free days between the groups at 3 months. There were no changes in the measure of functional health. IG had improved QOL when compared to baseline and greater adherence reported by caregivers to peak flow measurement and medication use when compared to the control group
Chan et al, 2003	6-17	To evaluate the effectiveness of telemonitoring in asthma control	Traditional education: The group had scheduled visits to receive asthma education from the case manager. Peak flow reading and printed symptom diary, presented at the follow-up visit	Asthma education through an educational website. Peak flow readings and asthma symptom diaries were recorded on the website	6 months	Adherence measures and disease control measures	CG: 5 and IG: 5	All measures of adherence decreased in both groups throughout the study, and symptom diary completion was low from the start. Both groups had good disease control, with rare unscheduled clinic visits due to exacerbation.

Reference	Age	Objective	CG	IG	Time	Outcome	Sample	Results
Bergman et al, 2008	5-12	To assess the feasibility and acceptance of the school-based telemedicine program	None	Video call between patient, school nurse, and specialist with an interview with patient and family (if present), observation of asthma-relevant exam, and analysis of spirometry data. Submission of asthma action plan and treatment recommendations. Follow-up teleconsultation. Asthma education via video call	4 meetings in 32 weeks	The measure of functional health, knowledge about the disease, and lung function	IG: 83	Significant improvement in the functional health status and knowledge of children and parents about asthma. The trend of improvement in the number of asthma attacks in the last 2 weeks. There were no significant changes in spirometry, hospitalizations, ER visits, or unscheduled visits to the primary care physician.
Bruzzese et al, 2021	12-17	To assess the impact of an internet-based intervention on adolescents with asthma	Written educational material used in previous studies on asthma and stress. Asthma education websites referral. Monitoring using printed diaries	Web-based intervention for adolescents with uncontrolled asthma, with seven modules with instructions and personalized sessions, hands-on interactive activities, personalized feedback, and dynamically generated supplemental resources. Complete daily asthma verification, with online feedback on asthma self-management and control efforts over the past seven days. Reminders sent by phone, text, and/or email	Not specified	Disease control measures, knowledge about the disease, and QoL	CG: 31 and IG: 30	Significant improvement in knowledge about asthma, in QOL, better control of the disease, improvement in nocturnal symptoms, and less school absenteeism in the IG. The risk of having at least one asthma-related emergency care appointment in the last three months was lower for IG participants
Del Corral et al, 2018*	7-18	To assess the effectiveness of a home exercise program using video games for children and adolescents with CF	Routine management, including inhaled antibiotics for respiratory infections, chest physiotherapy, nutritional supplementation, and exercise routine maintenance	Home training supervised by a virtual personal trainer and a heart rate monitor, with 30-60 min sessions, 5x/week, using a Nintendo Wii TM with the EA Sports game. The game involved activities such as running, squatting, and lunging with elbow flexion. Weekly, the video game included a maximum HR test. All activities were performed at fitness level 3, which is equivalent to 70 to 80% of maximum HR. The training load was increased each week. Weekly check-ins by phone. After the training period, patients were instructed to continue their individualized exercise program using the same	6 weeks + 12 months follow-up with exercise prescription	Tests of functional capacity, lower and upper limb strength and QOL	CG: 18 and IG: 17	Significant improvement in functional capacity, upper and lower limb strength, and QOL in the GI after 6 weeks of training. In the follow-up period, the IG obtained improvement in functional capacity and upper limb strength when compared to the CG

Reference	Age	Objective	CG	IG	Time	Outcome	Sample	Results
Montalbano et al, 2019	6-11	To evaluate the effectiveness of an educational program associated with a telehealth program in asthmatic children	Telehealth app	equipment at home for a 12-month follow-up period, with an exercise prescription of at least 2 days per week, 20 minutes per session. The educational program associated with a telehealth program: Three group sessions conducted by a multidisciplinary team to investigate patients' abilities, deliver a written action plan, understand the disease and how to deal with it, and through treatment demonstrations and interactive games assess acquired skills	3 months	Adherence measures, disease control measures, lung function, and QOL	CG: 25 and IG: 22	Significant improvement in lung function and QOL in both groups. Better disease control in the GI

Risk of bias assessment

The methodological quality of the selected studies was evaluated by applying, when possible, the PeDro scale, described in the Physiotherapy Evidence Database[19,20]. The score of the studies described in the electronic address of the database was used. When the score was not available, the assessments were carried out independently by two authors. In case of disagreement in scores between the two evaluators, a consensus was sought between them. Due to the impossibility of carrying out a randomized controlled clinical trial in the field of telehealth with the blinding of therapists or subjects, the maximum PeDro score achievable for the analyzed studies was 8 out of 10. The mean score according to the PeDro scale was 5.18, ranging from 3 to 8 points. Six of the studies submitted to this evaluation showed high methodological quality, that is, a score ≥6 (75% of the maximum possible score) (Table 2).

Table 2: Bias risk analysis (PeDro)

Author/Item	1	2	3	4	5	6	7	8	9	10	11	TOTAL
Chan et al, 2007	X	X		X						X	X	4
Gustafson et al, 2012	X	X	X	X				X	X	X	X	7
Jan et al, 2007	X	X	X	X						X	X	5
Perry et al, 2018	X	X		X						X	X	4
Chan et al, 2003	X	X								X	X	3
Bruzzese et al, 2021	X	X	X				X		X	X	X	7
Del Corral et al, 2018	X	X	X	X			X	X	X	X	X	8
Montalbano et al, 2019	X	X		X				X		X	X	5
Rikkers-Mutsaerts et al, 2012	X	X	X	X						X	X	5
Newcombe et al, 2012	X	X	X	X				X		X	X	6
Real et al, 2019	X	X						X	X	X	X	5
Joseph et al, 2013	X	X	X			X	X	X	X	X	X	8
Runge et al, 2006	X		X						X	X		3
Wiecha et al, 2015	X	X		X						X	X	4
Chen et al, 2018	X	X						X	X			3
Xu et al, 2010	X	X	X	X				X		X	X	6

A single study[21] did not meet the criteria of the PeDro scale, being submitted to analysis through the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Analytical Cross-Sectional Studies by a reviewer, independently. The study was assessed at moderate risk of bias, with a “yes” score of 62.5% (Table 3).

Table 3: Risk of Bias Analysis (JBI)

Nº	Yes	No	It is unclear	Not applicable
1	X			
2	X			
3			X	
4	X			
5			X	
6			X	
7	X			
8	X			
Total	62.50%		37.50%	

Presentation of results

As the interventions presented in the studies on the topic are carried out by several health professionals and in heterogeneous ways in their components, to organize the text and better interpretation of the results, the term telehealth was considered in the body of the review, due to variability of interventions and terms used in the included articles.

Results

We found 2,344 articles by searching the databases and, after removing the duplicates, 2,159 were sent for analysis of the titles. Of these, 1,873 were excluded because they did not meet the inclusion criteria, leaving 286 abstracts for evaluation. After analyzing the abstracts, 168 were excluded according to pre-established criteria, leaving 118 to be read in full. Six of them were removed because they were unavailable in full and 95 were excluded because they were studies that only evaluated usability/feasibility or that carried out only telemonitoring (without interventions). In the end, 17 studies were included in this review. By the selection of convenience sampling, no articles were included.

The period of publication of the selected articles is from 2003 to 2021. The respiratory conditions involved were asthma and CF, with 14 articles with asthma[21–34], 2 with CF[35,36], and 1 involving individuals with chronic respiratory diseases in general (asthma, CF, tracheomalacia, and bronchiectasis)[37].

The sample size ranged from 5 to 204 individuals in the intervention groups. Participants were between 3 and 20 years old, and 16 articles evaluated only the pediatric population (up to 18 years)[21–34,36,37]. Only one article included the pediatric and adult age groups, with a separate description of the results[35].

Participants in 7 studies received training or instructions for using the digital platform or website used as an intervention[22,25,27,28,30,33,35]. Patients included in 4 studies received the necessary equipment for the intervention, such as a computer, cell phone, peak flow meter, and/or internet access[25,28,30,37], and individuals participating in 4 other studies using the school equipment they attended[21,23,24,29]. In addition, 5 studies determined as inclusion criteria the participants having the necessary technological requirements for the intervention performed, such as having a smartphone and internet access[25,26,33,34,36].

All studies involving individuals with asthma carried out an online educational program, associated with telemonitoring of signs, symptoms, and medication adherence by filling in virtual diaries or phone calls. Some participants were also instructed to monitor peak expiratory flow measurement[22,25,28,30,33]. Asthma education was carried out by video call[21–23,29,32,33], audiovisual resources[25,26,28,30,31,37] or through virtual games[24,27,32,34]. A total of 4 studies implemented a discussion and socialization group among the participants in the intervention[24,25,27,37], and another 3 carried out some type of guidance for caregivers[22,29,32].

Individuals with CF participated in research involving interventions related to physical exercise using technological devices such as the Nintendo Wii36 and video calls with health professionals[35]. In both cases, cardiac monitors were used to monitoring and maintain moderate-vigorous physical activity intensity, defined as 60-80% of the maximum heart rate.

In most studies, telehealth intervention had similar effects to usual care on disease control outcomes[22,30], pulmonary function data[22,24,28,30,33,37], QoL[22,32,33], symptom-free days[29], knowledge about asthma[30,33]

medication adherence[27,30,33]. On the other hand, some authors reported better results in the intervention group, when compared to the control group, in the outcomes related to the Asthma Control Test score[27,31,32,34], reduction of nocturnal and daytime symptoms[23,28], lower number of the night walking and school absenteeism[31], greater distance walked in the Modified Shuttle Walk Test[36], improvement in muscle strength[36], reduction of emergencies and the use of rescue medication[24], in addition to better adherence to the symptom diary[22] and the medication diary when compared to the control group that kept the diaries in writing[28].

Only one of the selected articles did not present a control group, bringing the comparison between pre- and post-telehealth intervention data. This study showed positive results in the physical and social domain of QoL through the Children's Health Survey for Asthma questionnaire and in knowledge about the disease. However, there were no significant changes in lung function and the number of hospitalizations[21].

Discussion

Telehealth generically designates any type of health care performed using a virtual resource[1]. With the advancement of technology and the dissemination of this type of resource, especially during the Covid-19 pandemic, specific terms for each profession have become more common to name the service provided online. In the case of physiotherapy, the terms telerehabilitation and telephysiotherapy were incorporated to designate the practice of physiotherapy using virtual resources. However, these denominations vary between professions and between countries, which is one of the limitations of studies involving health strategies that use virtual technology or telecommunications.

The interventions identified in the studies selected in this review were carried out by health professionals such as physical therapists, nurses, doctors, and psychologists, and the modalities of technologies used to offer this type of assistance included e-mails, videos, telephone calls, interactive games for educational purposes and for physical exercise, audiovisual material, mobile applications and filling out an electronic diary. This shows a greater possibility of controlling the disease since the interventions can be reproduced anywhere and by different health professionals, according to the reality of each location.

Similar results between the control group and the intervention group in most studies demonstrate savings in the health system considering that self-management and control actions for chronic respiratory diseases, carried out online or in person, improve medication adherence, function lung function, self-efficacy, and school attendance, in addition to reducing emergency room visits, which are consequently cheaper when compared to the costs of hospitalizations, medical visits, and other care needed in exacerbations[38–43]. In addition, monitoring carried out online, through telehealth, is more cost-effective than that carried out in person[44], since providing the necessary technology for mobile communications is cheaper than face-to-face health services, while at the same time, it contributes to the improvement of the QoL of those involved, through work, leisure and financial aspects[1].

Parity between interventions (usual care and telehealth) is beneficial because technological means allow a greater geographic reach of physiotherapy and other health services, being positive for individuals who live far from rehabilitation centers and medical centers who live in cities without access to this type of service in person and to patients with contact restrictions.[6,45]

However, health services that use technological means are still excluded due to the difficulty of accessing the internet and telecommunication equipment in various social groups that could benefit from this type of service. Despite the exponential increase internationally in the use of mobile devices in recent years and the high diffusion of internet use, in low- and middle-income countries the number of mobile phone subscriptions does not reflect the real numbers, given that a phone can be used by a family or group of people. Therefore, there are still barriers to accessing smartphones and the internet due to costs and network infrastructure, making it difficult to democratize telehealth services, especially those that require a greater amount of data. Another barrier found in this type of care is related to the digital literacy of patients, especially when it comes to children and adolescents, requiring a linguistic adaptation according to the age and literacy level of each individual, as performed by Bruzzese et al.[31].

When it comes to chronic respiratory diseases, the commitment of these patients to the treatment is extremely important, since the results of the intervention and especially the control of the disease

depend on this factor. In the study by Portnoy et al., individuals who participated in telehealth visits were more likely to complete all asthma follow-up sessions compared with individuals who performed usual face-to-face visits[46]. In addition, the adherence of asthmatic children and adolescents to the online symptom and medication diaries is greater when compared to the adherence to the written form of the symptom diary[22,28], a situation confirmed in a previous review that reported that asthmatic adolescents prefer to use technology to improve adherence to self-management actions[17]. A previous review showed greater adherence to physical activity performed at home by individuals with CF[47], as these individuals have difficulty adhering to exercise routines when the activity is boring or unpleasant[48]. Such features further reinforce healthcare cost-saving opportunities by lowering no-show rates and enabling specialists to see more patients.[38]

Another important factor in the control of chronic respiratory disease is knowledge about the health condition, which has a great impact on QoL, self-management, and self-efficacy, consequently bringing better control of the disease (asthma), knowledge and self-management skills[49], with patient education being the central component of asthma self-management programs in adults and children[50]. As already seen, educational interventions for children with asthma bring benefits in controlling the disease, in aspects such as pulmonary function, frequency of school absenteeism, number of emergency room visits, and self-efficacy, consequently improving QoL[49,51,52]. Therefore, as reported in 15 studies included in this review, associating health education actions with telehealth strategies is a good therapeutic approach for children and adolescents with chronic respiratory diseases[21–34,37].

Conclusion

Given the above, this review identified that telehealth actions have proven to be a viable, low-cost, and accessible resource for the majority of the population in terms of monitoring, treatment adherence, pulmonary function, QoL, education, and disease control in children and adolescents with chronic respiratory diseases, and can be used as alternative interventions or adjuncts to conventional face-to-face treatment.

Considering the need for adaptations of health services, the variability of interventions carried out in the selected articles and the constant technological evolution of the equipment used for telehealth actions, it is suggested to carry out new studies involving the theme of telehealth to enrich the literature on the subject in the population with pediatric lung diseases.

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