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REVIEW

Effects of caregiver-involved interventions on the quality of life of children and adolescents with chronic conditions and their caregivers: a systematic review and meta-analysis

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Abstract

Purpose Childhood chronic conditions have a considerable effect on the quality of life (QoL) of pediatric patients and their caregivers. The purpose of this meta-analysis was to evaluate the effects of caregiver-involved interventions on the QoL of children and adolescents with chronic conditions and their caregivers.

Methods The PubMed, EMBASE, Web of Science, Cumulative Index of Nursing and Allied Health Literature, Academic Search Complete, Education Resource Information Center, and PsycINFO databases were searched for published randomized controlled trials from inception to April 2016. Two reviewers (NS and JM) independently screened included studies and assessed study quality. The meta-analyses and meta-regressions using random-effects models were performed with the Comprehensive Meta-analysis software (version 3, Biostat, Englewood, NJ).

Results Fifty-four studies involving 10075 pediatric patients diagnosed with asthma, diabetes, cancer, hypersensitivity, cerebral palsy, arthritis, or sickle cell diseases and 10015 caregivers were included in our analysis. The interventions mainly involved education about disease, skill training, environment change, psychological intervention, physical exercise, experience sharing, monitoring, or social support. The results demonstrated that caregiver-involved interventions significantly improved the health-related QoL (HRQoL) of caregivers [standardized mean difference (SMD) = 0.26, 95% CI 0.14–0.38, $p < 0.001$], particularly those delivered through the face-to-face mode (SMD = 0.32, 95% CI 0.21–0.43, $p < 0.001$). However, no improvements in the QoL (SMD = 0.00, 95% CI −0.22 to 0.22, $p = 1.00$) and HRQoL (SMD = 0.06, 95% CI −0.02 to 0.14, $p = 0.16$) of children and both caregivers and children (SMD = 0.04, 95% CI −0.08 to 0.17, $p = 0.52$) were observed.

Conclusions This meta-analysis provides evidence on the positive effects of caregiver-involved interventions on the HRQoL of caregivers. Moreover, face-to-face mode is the delivery approach with a promising effect on the HRQoL of caregivers. Further research on conditions not found in this review is warranted.

Keywords Caregiver-involved intervention · Child · Chronic disease · Meta-analysis · Meta-regression · Quality of life

Introduction

Childhood chronic health condition is defined as "a health condition that lasts 12 months or a diagnosis is likely to have a duration of 12 months" [1]. The diagnosis of childhood chronic disease is a complex and time-consuming process, and this condition can cause delayed growth, persistent symptoms, repeated hospitalizations, poor school attendance, with its prevalence gradually increasing worldwide [2]. Moreover, psychological outcomes, including stress, anxiety, low self-esteem, and poor quality of life (QoL), are the major concerns for pediatric patients [3].

Additionally, children with chronic illnesses are dependent on their caregivers, which cause work absences,

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perceived burden associated with the daily demands of care, impaired capacity, and reduced QoL on the side of the caregivers [4]. The mediating role played by parents or other family caregivers in the interaction between the child and healthcare providers must be taken into account. Learning to manage symptoms and addressing the psychosocial effects of the condition on their children can lead to changes within the family system [5]. The health outcomes of the children are in turn influenced by their caregivers' health, thus forming a vicious circle [6, 7]. In this circumstance, caregiver-involved interventions, which are defined as any treatments received by the caregivers of patients that is proven to be beneficial for families with chronically ill children, are increasingly performed worldwide [8].

QoL is paramount in the achievement of optimal psychosocial and treatment outcomes. The QoL of children with chronic diseases is particularly important because many of these children will not be cured but will live long and continue to manage their chronic illness into adulthood. The QoL of the caregivers is known to influence disease management behaviors. To that end, the measurement of the QoL of the caregivers offers critical insight into the degree to which a health condition interferes with daily life activities and depletes psychosocial and financial resources [9]. Considering the interaction between the children and caregivers functioning and identifying caregivers at risk for poor health-related quality of life (HRQoL) are included in usual treatment for all pediatric chronic illnesses [10]; emphasis has been placed on the improvement of the HRQoL of the caregivers through intervention targeting the associated risk factors [11, 12]. HRQoL as an important sub-domain of QoL focuses on the specific aspects of QoL influenced by a health condition and has always been highly praised by medical researchers [13].

Previous meta-analyses have demonstrated that parent- or family-involved interventions improve the parent- or child-level outcomes, including child symptoms, parent behaviors, and mental health [8, 14]. However, limited data are available to systematically evaluate the type and degree of efficacy of caregiver-involved interventions on the QoL of chronically ill children and their caregivers. A systematic review and meta-analysis including solely asthmatic children suggested that home-based interventions are associated with the QoL outcome [15]. However, other systematic reviews focused on the effectiveness of the interventions on QoL but did not cover caregiver involvement [16–18].

Many studies on caregiver-involved interventions used diverse types, settings, participants, and outcome measures and showed inconsistent results with regard to the QoL of pediatric patients and their caregivers. This gap in the literature prevents researchers and clinicians from elucidating how caregiver-involved interventions could influence the QoL of pediatric patients and their caregivers. Hence, synthesizing the results of these studies is quite necessary to acquire a comprehensive understanding on the effects of caregiver-involved interventions on the child and caregivers' QoL. Therefore, the objective of this systematic review and meta-analysis is to determine the effectiveness of these interventions on the QoL, either that of the caregivers or children and to investigate the factors associated with improved QoL.

Methods

Overview

This systematic review and meta-analysis followed the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) [19].

Search method

A systematic search of RCTs that were published from January 1, 1950 of the PubMed, January 1, 1974 of the Embase, January 1, 1950 of the Web of Science, January 1, 1937 of the Cumulative Index of Nursing and Allied Health Literature, January 1, 1887 of the Academic Search Complete, January 1, 1597 of the PsycINFO, and January 1, 1966 of the Education Resource Information Center databases to April 2016 was conducted. Trial registries and gray literature were not included. Four main Mesh headings and keyword clusters related to child, chronic conditions, caregiver, and interventions were determined through the appendices of relevant reviews and articles that focused on interventions involving caregivers of children with chronic conditions. Table 1 displays the alternative terms. Additionally, the reference lists of the included studies and review articles were scanned to search for additional trials and earlier meta-analyses.

Eligibility criteria

The search was limited to studies published in English language. The studies were selected based on the results of the combination of the population (P), intervention (I), comparison (C), outcome (O), and study design (S) acronym: P, children aged 0–18 years old who were diagnosed with a chronic disease, including asthma, hypersensitivity, diabetes, anemia, arthritis, joint diseases, hematologic diseases, neoplasms, cerebral palsy, brain concussion, cystic fibrosis, epilepsy, frequent headache, craniocerebral trauma, heart diseases, migraine disorders, and muscular dystrophies; I, parent- or other family member-involved interventions; C, interventions without parents or other family members, usual care, wait-list control, or educational material delivery; O, QoL measured through questionnaires, either for the ill child or for the caregivers; and S, RCT. Meanwhile, the exclusion

Table 1 Alternative terms for Mesh headings or keywords

	Caregiver	Child	Chronic disease	Intervention
Alternative terms	Family; Famil*; Caregivers; Caregiver*; Parents; Parent*; Mothers; Mother*; Fathers; Father*; Siblings; Sister*; Brother*; Sibling*; Grandparents; Grandparent*; Grandmother*; Grandfather*; Aunt; Uncle	Infant; Child; Adolescent; Child*; Teen*; Adolesc*; Infant*; Newborn*	Chronic disease; Chronic illness; Asthma; Hypersensitivity; Allerg*; Anemia; Joint diseases; Arthriti*; Hematologic diseases; Blood problems; Blood disease; Blood diseases; Neoplasm*; Cancer*; cerebral palsy; Concussion*; Heart defects, congenital; Congenital heart disease; Congenital health disease; Congenital heart diseases; Cystic fibrosis; Diabetes Mellitus; Diabetes Insipidus; Diabet*; Seizure disorder; Epilep*; Frequent headache; Frequent headaches; Head injury; Head injuries; Craniocerebral trauma; Heart disease; Heart diseases; Migraine disorders; Migraine*; Muscular dystrophies; Muscular dystrophy; Anemia, sickle cell; Sickle cell disease; Brain injuries; Traumatic brain injury; Traumatic brain injuries	Educat*; Therap*; Intervention*; Program*; Instruction*; Train*; Treatment*; Support*; Care

Asterisk symbol reflected inside the Table is a wildcard that represents any number of arbitrary characters

criteria for the studies were as follows: without parental involvement or use of surgical or drug interventions; non-RCT design; absence of parent or children QoL reporting; dissertations; and scoping, systematic, integrative, and meta-analysis reviews.

Three authors assessed the accuracy of the screening process in accordance with the inclusion and exclusion criteria. Following the removal of duplicate studies, two authors independently reviewed each study to determine eligibility for inclusion based on the title and abstract. After reaching a consensus on titles and abstracts that met the criteria, full-text articles were screened to determine whether they would be included. In case of a disagreement between the two authors, a third author evaluated the study. Figure 1 illustrates the flow diagram of the detailed literature search.

Data extraction

Data extraction was also conducted by two authors. The following data were extracted: (1) general information on these RCTs, such as the title, author, publication date, country, location, sample size, and chronic diseases studied; (2) details of the intervention, such as setting, time of each section, intensity (number of contacts), duration, content, mode, and follow-up time; (3) key elements of the quality assessment; and (4) the effects of the interventions on the QoL, either that of the parents or children, and measurement tools. The QoL was presented as mean (M) and standard deviation (SD). If the study did not report the M and SD, other data, such as standard errors, confidence intervals, t or p values, were calculated to obtain the values. Table 2 presents these details.

Quality assessment

The quality of the included studies was independently evaluated by the first and second authors (NS and JM) based on the criteria set by the Joanna Briggs Institute [20]. The criteria consist of ten entries, including random assignment, blinding of participants, allocation concealment, outcome data completion, blinding of assessment, baseline comparability, same treatment, same measurement, measurement reliability, and appropriate statistical analysis. The quality assessment was performed using the qualitative descriptors yes, no, or unclear. Disagreements between the two authors were solved through discussion with a third author (YZ).

Data synthesis and analyses

The meta-analysis was conducted using the Comprehensive Meta-analysis software (version 3; Biostat, Englewood, NJ, United States). The sample size, mean of QoL scores at follow-up, and standard deviation were used to calculate

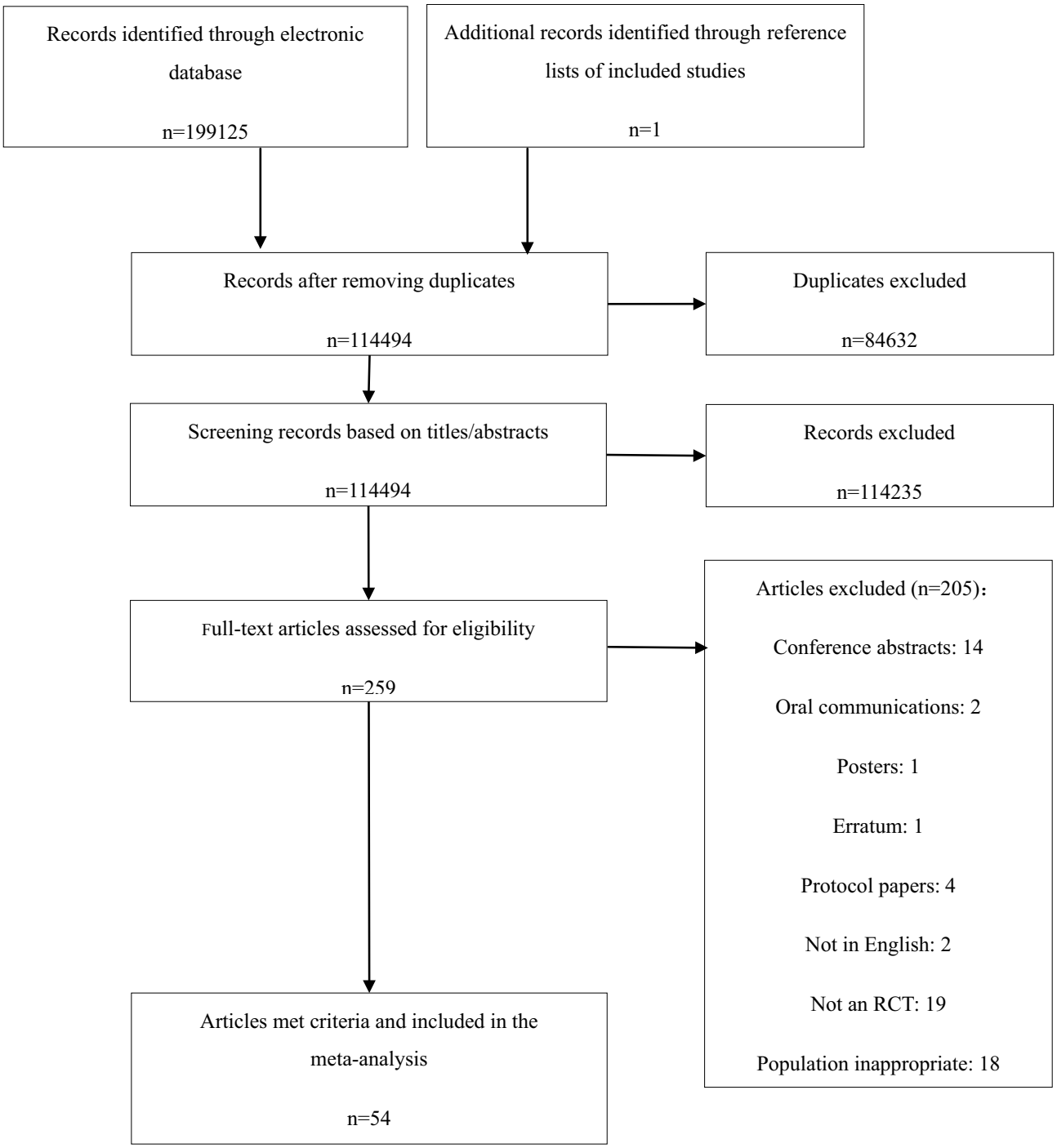

Fig. 1 Flow chart of the literature screening process

the individual effect size. In case these data were unavailable, the mean difference, standard errors, 95% confidence interval (CI), or results from comparative analyses, such as *t* or *p* value, were used for the analysis. Considering that different scales were used in those studies to evaluate the QoL and ensure that the scales were in the same direction, the standardized mean difference (SMD) along with its 95% CI was calculated for every outcome as the pooled effect size. We included the final outcomes for studies reporting several follow-up outcomes. Concurrently, the results were combined to yield a single effect size per study for three studies including several parent-involved intervention groups [21–23], four studies including several age groups [24–27], or only dimensional scores of QoL (12 studies)

Table 2 Characteristics of included studies

Study	Country/setting	Children's characteristics N (T/C)	Intervention			C	Follow-up months[a]	QOL assessment	
			T					Child	Caregiver
			Duration	Content	Mode				
Ambrosino et al. [33]	USA hospital	N = 65/46 T1D Average 9.9 (8–12) years old	1.5 h/session, 6 sessions	Parent + child: coping skills training	Face to face Separate parent, child Group intervention	Education about disease care	3	⑫[b]	
Barrera et al. [55]	Canada hospital	N = 21/22 Cancer Average 8.6 years old	6 months	Parent: completing the revised psychosocial assessment tool and the outcomes were provided to the medical team	Face to face Parent	Usual care	6	④[b]	
Brown et al. [44]	USA home	N = 49/46 Asthma Average 4.3 (1–6.99) years old	90 min/session, 8 sessions, weekly	Caregiver + child + other members: education about disease tailored to the family	Face to face Caregiver + child + others Individual education	Usual care	12		⑧[b]
Butz et al. [45]	USA school	N = 130/91 Asthma Average 8.0 (6–12) years old	Parent: 1 h/1 session Child: 4 h/2 sessions	Parent + child: education about disease and symptom management	Nurse-lead Face to face Separate parent, child Group intervention	Usual education	10	②[b]	①[b]
Campbell et al. [56]	USA home	N = 182/191 Asthma Average 8.3 (3–17) years old	4 visits, 2 calls	Caregiver + child: education, support, and service coordination provided by a community health worker	Face to face + telephone Caregiver + child Individual intervention	Usual care	12		①[c]
Canino et al. [64]	USA home	N = 110/111 Asthma Average 7.4 (5–12) years old	2 visits	Parent: education about disease and symptom management, communication and stress management	Counselors-lead Face to face + telephone Parent Individual intervention	Education materials only	4		①[c]
Cano-Garcinuño et al. [65]	Spain, Uruguay, Cuba hospital	N = 182/63 Asthma Average 11.0 (9–13) years old	45–60 min/session, 1 session/ 2 weeks, 3 sessions, 4 weeks	Parent + child: education about disease and symptom management	Nurse-lead Face to face Parent + child Group education	Unclear	6	②[b]	①[b]
Chan et al. [78]	USA home	N = 60/60 Asthma Average 9.6 (6–17) years old	6 visits, 52 weeks	Parent + child: education about disease management via Internet at home	Face to face + Internet Parent + child	Usual care	12	②[b]	①[b]

Table 2 (continued)

Study	Country/setting	Children's characteristics N (T/C)	Intervention				Follow-up months[a]	QOL assessment	
			T			C		Child	Caregiver
			Duration	Content	Mode				
Chinn et al. [24]	UK hospital	N = 119/116 Atopic eczema Average 5.6 (0.5–16) years old	30 min/session, 1 session	Parent + child: education about disease and symptom management	Nurse-lead Face to face Parent + child Individual intervention	Unclear	12 weeks	⑨ and ⑩[b]	
Daniel et al. [57]	USA hospital	N = 42/41 Sickle cell disease Average 8.5 (6–12) years old	75–90 min/session, 4 sessions/workshop, 1 workshop; 30 min/call, 3 calls	Caregiver + child + sibling: psychoeducation about disease and problem-solving model	Face to face + telephone Caregiver + child + sibling Group + individual intervention	Wait-list control	6	③[b]	
Deschildre et al. [46]	USA home	N = 25/25 Asthma Average 11.1 (6–16) years old	1 visit/4 months	Parent + child: home telemonitoring	Face to face + network Parent + child	Usual care	12	②[b]	
Farrokhnia et al. [47]	Iran hospital	N = 21/20 Cancer Average 6.5 (5–8) years old	2 visits	Parent + child: cognitive interventions include story, picture, maze, cartoon	Face to face Parent + child Individual intervention	Usual care	Post treatment	⑦[c]	
Fiks et al. [34]	USA home	N = 30/30 Asthma Average 8.3 (6–12) years old	6 months	Parent: a shared decision-making portal	Internet Parent	Usual care	6	⑮[b]	
Flores et al. [66]	USA home	N = 112/108 Asthma Average 7.3 (2–18) years old	Monthly, 12 months	Parent + child: education about disease and symptom management	Nurse-lead Face to face + telephone Parent + child	Usual care	12	③[b]	①[b]
Garbutt et al. [58]	USA home	N = 190/172 Asthma Average 6.8 (5–12) years old	Monthly, 12 months	Parent: education about disease and symptom management via telephone	Peer-lead Telephone Parent	Usual care	12	②[b]	①[c]
Garbutt et al. [59]	USA home	N = 462/486 Asthma Average 6.9 (3–12) years old	Monthly, 12 months	Parent: education about disease and symptom management via telephone	Peer-lead Telephone Parent	Usual care	24		①[c]

Table 2 (continued)

Study	Country/setting	Children's characteristics N (T/C)	Intervention				Follow-up months[a]	QOL assessment	
			T			C		Child	Caregiver
			Duration	Content	Mode				
Ghodsbin et al. [48]	Iran hospital	N = 40/40 Leukemia Average 9.4 (7–10) years old	45–60 min/session, 3 sessions	Parent: education about disease and symptom management, and communication	Face to face Parent Group intervention	Unclear	2		⑯[c]
Graue et al. [25]	Norway hospital	N = 62/54 T1D Average 14.2 (11–17) years old	3 h/visits, 3 visits; 45 min/consultation, 3 consultations; 15 months	Parent: education about disease and symptom management, sharing knowledge and experience Child: education about disease and symptom management, discussion about problem-solving skills, family and peer support, sharing experience	Face to face + Internet Separate parent, child Group + individual intervention	Usual care	15	㉓[b]	
Grey et al. [35]	USA hospital	N = 65/46 T1D Average 9.9 (8–12) years old	1.5 h/session, 6 sessions, weekly	Parent + child: coping skills training	Face to face Separate parent, child Group intervention	4 sessions about general education	12	⑫[b]	
Grey et al. [60]	USA hospital	N = 106/75 T1D Average 8.0 (0–12) years old	1.5 h/session, 6 sessions	Parent: coping skills training	Face to face Parent Group intervention	4 sessions about general education	12		⑬[b]
Grillo et al. [67]	Australia hospital	N = 32/29 Atopic eczema Average 4.3 (0–16) years old	2 h/workshop	Parent + child: education about disease and symptom management	Nurse-lead Face to face Parent + child Group intervention	Unclear	12 weeks	⑨ and ⑩[c]	
Hederos et al. [49]	Sweden hospital	N = 32/28 Asthma Average 2.2 (3 months–6) years old	1.5 h/session, 3 sessions, weekly, 6 months later, the fourth	Parent: education about disease and symptom management, family relations	Nurse-lead Face to face Parent Group education	Usual care	72		①[c]
Horner and Brown [43]	USA school + home	N = 101/82 Asthma Average 8.8 years old (2–5 grades)	15 min/session, 16 sessions, 3 sessions/week, 5.5 weeks	Child: education about self-management and problem-solving Parent:education about daily disease management	Nurse-lead Face to face Separate parent, child Group + individual intervention	15 min/session, 16 sessions, education about usual care	7	②[b]	

Table 2 (continued)

Study	Country/setting	Children's characteristics N (T/C)	Intervention				Follow-up months[a]	QOL assessment	
			T			C		Child	Caregiver
			Duration	Content	Mode				
Hsin et al. [36]	China home	N = 11/12 Cerebral palsy Average 6.9 (6–8) years old	3.5–4 h/day, 2 times/week, 4 weeks	Parent: supervising children and document the number of restraint hours Child: home-based constraint-induced therapy	Face to face Parent + child	Usual rehabilitation	3	⑪[c]	
Jaser et al. [75]	USA home	N = 20/19 T1D Average 15.1 (13–17) years old	8 weeks	Parent: providing weekly affirmations to children by a short note or a text message Child: positive psychology including gratitude, self-affirmation, small gifts, and parent affirmations	Face to face + phone Parent + child	Educational materials	6	⑤[b]	
Kamps et al. [68]	Netherlands hospital	N = 37/37 Asthma Average 6.4 (2–16) years old	1 year	Parent + child: detailed education about disease and symptom management	Nurse-lead Face to face Parent + child	Follow-up by a Pediatrician, details were unclear	12	②[b]	①[b]
Katz et al. [22]	USA hospital	N = 102/51 T1D Average 12.9 (8–16) years old	Telephone or email/month; 30 min/session, quarterly	CA + group: outreached by the care ambassador via phone or email, care and care coordination CA + Ultra group : the same with CA + group, realistic expectations and problem-solving strategies	Care ambassador-lead Face to face + telephone/email Parent + child	Usual care	24	③[b]	
Khan et al. [71]	Australia home	N = 155/155 Asthma Average 7.5 (1–15) years old	5–44 min/call	Parent: education via telephone + written materials	Nurse-lead Telephone Parent	Written education materials	6		①[b]
Kichler et al. [77]	USA hospital	N = 14/16 T1D Average 15.2 (13–17) years old	50–75 min/session, 6 sessions, 6 weeks	Parent + child: education about disease and symptom management, behavior therapy, and family therapy	Psychologist-lead Face to face Parent + child Group intervention	Wait-list control	6 weeks	③[c]	
Kieckhefer et al. [69]	USA hospital	N = 83/46 Chronic conditions Recruit 2–11 years old	2 h/session, 7 sessions, weekly	Parent: discussions about information and insights among parents	Face to face Parent Group intervention	Wait-list control	6		⑰[c]

Table 2 (continued)

Study	Country/setting	Children's characteristics N (T/C)	Intervention				Follow-up months[a]	QOL assessment	
			T			C		Child	Caregiver
			Duration	Content	Mode				
Krieger et al. [61]	USA home	N = 138/136 Asthma Average 7.4 (4–12) years old	5–9 visits, 12 months	Parent + child: home environment, education about disease and symptom management, social support	Nurse-lead Face to face Parent + child Individual intervention	Only 1 visit	12		①[c]
Krieger et al. [42]	USA hospital + home	N = 153/156 Asthma Average 8.0 (3–13) years old	4 sessions, 1 session/3 months + mean 4.5 visits	Caregiver + child: home environment, education about disease and symptom management, social support	Nurse-lead Face to face Caregiver + child Individual intervention	Usual education	12		①[c]
Krishna et al. [50]	USA hospital	N = 119/127 Asthma Recruit 0–18 years old	44 sessions, 12 months	Caregiver + child: education about disease and self-management via Internet	Internet Caregiver + child	Usual education	12	②[b]	①[b]
Laffel et al. [74]	USA home	N = 52/53 T1D Average 12.1 (8–17) years old	15 min/visit, quarterly, 1 year	Parent + child: training about parent–child responsibility-sharing and ways to avoid conflict	Face to face Parent + child Individual intervention	Usual care	12	③[b]	
Lomholt et al. [31]	Denmark hospital	N = 9/10 JIA Average 11.7 (9–14) years old	120 min/session, 6 sessions, weekly or biweekly, 8 weeks	Parent + child: education about pain and its management Parent: discussion about homework	Psychologist-lead Face to face Parent + child Group intervention	Unclear	8 weeks	③[b]	
Marchese et al. [41]	USA hospital + home	N = 13/15 Leukemia Average 7.7 (4–15) years old	20 min–1 h/session, 5 sessions, 12 weeks; home exercise for 4 months	Parent + child: instruction about home exercise Child: stretching and strengthening exercises	Face to face Parent + child	No instructions and physical therapy	4	③[b]	
McGhan et al. [76]	Canada school	N = 104/162 Asthma Average 8.6 (6–13) years old	Parent and teacher: 2 h Child: 45–60 min/session, 6 sessions	Parent + teacher: education about disease management, school issues and the program Child: education about disease and symptom management, lifestyle, and information-sharing	Face to face Separate parent, child Group intervention	Usual care	12	②[c]	

Table 2 (continued)

Study	Country/setting	Children's characteristics N (T/C)	Intervention				Follow-up months[a]	QOL assessment	
			T			C		Child	Caregiver
			Duration	Content	Mode				
Murphy et al. [32]	Australia hospital	N = 158/147 T1D Average 13.1 (11–16) years old	90 min/session, 6 sessions, monthly	Parent + child: self-management education and family communication training	Face to face Parent + child Group education	Usual care	6	⑱[b]	
Revel and Baynouna [51]	United Arab Emirates hospital	N = 83/70 Asthma Average 9.8 (6–15) years old	6 months	Parent + child: education about disease and symptom management	Face to face Parent + child	Unclear	6	②[b]	①[b]
Rice et al. [70]	USA hospital	N = 356/355 Asthma Average 6.9 (2–17) years old	30–60 min/session, 1 session	Parent + child: education about self-management and environmental modification	Face to face Parent + child Individual education	Usual care	1	⑥[b]	
Seid et al. [21]	USA home	N = 165/87 Asthma Average 7.4 (2–14) years	CC group: 45–60 min/session, 5 sessions, weekly, 5 weeks CC + PST group: 11 sessions, weekly, 11 weeks	CC group (parent + child): education about disease and symptom management, community support CC + PST group (parent + child): same contents with CC group + problem-solving skills training	Face to face Parent + child, focus on parent Group + individual intervention	Usual care	6	CC: ③[b]; CC + PST: ③[c]	
Shaw et al. [26]	USA hospital	N = 77/74 Atopic dermatitis Average 5.5 (0–18) years old	A 15-min session	Parent + child:individual education about disease and symptom management	Educator-lead Face to face + telephone Parent + child	Unclear	3	⑨ and ⑩[b]	
Sockrider et al. [52]	USA hospital	N = 263/201 Asthma Average 6.6 (1–18) years old	During ED setting	Caregiver + child:education about self-management via computer resource	Educator-lead Face to face + telephone Parent + child Individual education	Usual care	9	⑮[b]	
Staab et al. [53]	Germany hospital	N = 93/111 Atopic dermatitis Average 3.1 years old	2 h/session, 6 sessions, weekly, 6 weeks	Parent: education covering medical, psychological, and nutritional topics	Face to face Parent Group intervention	Wait-list control	12		⑲[c]
Staab et al. [27]	Germany hospital	N = 446/377 Atopic dermatitis Average 4.8 (0.25–18) years old	2 h/session, 6 sessions, weekly, 6 weeks	Parent + child: education covering medical, psychological, and nutritional topics	Face to face Parent + child Group intervention	No education	12		⑳[c]

Table 2 (continued)

Study	Country/setting	Children's characteristics N (T/C)	Intervention				Follow-up months[a]	QOL assessment	
			T			C		Child	Caregiver
			Duration	Content	Mode				
Stevens et al. [62]	England hospital	N = 101/99 Asthma Average 2.7 (1.5–5) years old	20 min/session, 2 sessions	Parent + child: education about disease and symptom management	Nurse-lead Face to face Parent + child Individual intervention	Usual care	12		①[b]
Stinson et al. [63]	Canada home	N = 22/24 JIA Average 14.5 (12–18) years old	Log in the site once a week; 7–30 min/call, mean 1.6 calls/week; 12 weeks in total	Caregiver: healthy behavior encouragement Child: education about disease and self-management, social support	Internet + phone Caregiver + child	Discussion about "own best efforts"	12 weeks	㉑[b]	
Tanir and Kuguoglu [29]	Turkey hospital + home	N = 20/21 Leukemia Average 10.5 (8–12) years old	3 months	Parent: serve as a supporting and motivating force Child: physical exercise	Face to face + telephone Parent + child	No exercise advices	3	④[b]	
Tiberg et al. [28]	Sweden hospital	N = 30/30 T1D Average 8.7 (3–15) years old	1 week	Parent + child: home-like environment, support, educational sessions	Face to face Parent + child	Usual care	12		⑭[c]
Valery et al. [72]	Australia home	N = 42/71 Asthma Average 6.9 (1–17) years old	4 sessions, 6 months	Caregiver + child: education about disease	Health worker-lead Face to face Parent + child	Only once education	12	②[b]	①[b]
Walders et al. [73]	USA hospital	N = 89/86 Asthma Average 7.3 (4–12) years old	1 h/session, 1 session, 1 week	Parent + child: resources including disease management plan and so on, education about disease and problem-solving skills	Nurse-lead Face to face Parent + child Individual intervention	Resources including disease management plan, etc.	12	㉒[b]	
Weber et al. [54]	Brazil hospital	N = 18/18 Atopic dermatitis Average 6.6 (2–16) years old	90 min/meeting, 6 months	Parent: discussion about experience Child: education about disease and treatment; playful activities	Face to face Separate parent, child Group intervention	Unclear	6	⑩[c]	

Table 2 (continued)

Study	Country/setting	Children's characteristics N (T/C)	Intervention				Follow-up months[a]	QOL assessment	
			T			C		Child	Caregiver
			Duration	Content	Mode				
Wely et al. [30]	Netherlands home	N = 25/24 Cerebral palsy Average 9.7 (7–13) years old	1 h/exercise, twice a week, 2 months; then once a week, 2 months	Parent: motivating and coaching the child Child: lifestyle intervention and fitness training	Face to face Parent + child Group intervention	Regular pediatric physiotherapy	12	⑪[b]	
Whittingham et al. [23]	Australia hospital	N = 45/22 Cerebral palsy Average 5.2 (2–12) years old	SSTP: 2 h/session, 6 sessions; 30 min/call, 3 calls ACT: 2 h/session, 2 sessions	SSTP group(parent): training about parenting strategies SSTP + ACT group(parent): training about parenting strategies + enhancing psychological flexibility	Face to face + telephone Parent Group + individual intervention	Wait-list control	Post treatment	⑪[c]	

T treatment group, *C* control group, *T1D* type 1 diabetes, *JIA* juvenile idiopathic arthritis

[a]Mean QoL scores in our study represented scores at follow-up

[b]Effects in the intervention group were not better than in the control, ① Pediatric Asthma Caregiver's Quality of Life Questionnaire, ② Pediatric Asthma Quality of Life Questionnaire, ③ PedsQL™ 4.0 Generic Core Scales, ④PedsQL™ 3.0 Cancer Module, ⑤ PedsQL™ 3.0 Diabetes Module, ⑥ PedsQL™ 3.0 Asthma Module, ⑦ PedsQL™ Present Functioning Visual Analogue Scales, ⑧ Adapted Pediatric Asthma Caregiver's Quality of Life Questionnaire, ⑨ Infant's Dermatology Quality of Life Index, ⑩ Children's Dermatology Life Quality Index, ⑪ Cerebral Palsy Quality of Life questionnaire, ⑫ Diabetes Quality of Life Scale for Youth, ⑬ Parents Diabetes Quality of Life Questionnaire, ⑭ SF-36: MOS 36-item Short Form Health Survey, ⑮ Integrated Therapeutics Group Child Asthma Short Form, ⑯ QoL scale, ⑰ Family impact scale, ⑱ Short form of the Diabetes Quality of Life Youth scale, ⑲ A disease-specific health-related QoL questionnaire, ⑳ German questionnaire "Quality of life in parents of children with atopic dermatitis," ㉑ Juvenile Arthritis Quality of Life Questionnaire, ㉒ Children's Health Survey for Asthma, ㉓ Diabetes Quality of Life Questionnaire

[c]Effects in the intervention group were better than in the control

[d]Only children under 13 years old were included

rather than the total score [23, 25, 27–36]. We computed the combined effect across interventions or outcomes based on the guidance of CMA 3.0 Manual V3, and the book written by Borenstein et al. [37]. In contrast, we selected the self-reported outcomes for studies reporting the QoL of children from both caregivers and children. Lastly, we separately analyze studies with HRQoL measures and general QoL measures. Random-effects models were performed to calculate the pooled effect size and the I^2 test was used to estimate statistical heterogeneity between studies. When $I^2 < 50\%$ and $p > 0.1$, this indicates an acceptable level of consistency. Meta-regressions and subgroup analyses were conducted to explore potential factors influencing the results of the interventions [38]. Moreover, variables significant at $p < 0.05$ in univariable meta-regression were entered into the multivariable meta-regression. A publication bias was evaluated by Egger's test [39] and Begg and Mazumdar's rank correlation test [40]. A symmetrical funnel shape suggested lack of bias, with a zero intercept in Egger's test or zero association between effect estimates and standard error in Begg and Mazumdar's test. The sensitivity analyses were conducted through iteratively removing one study at a time to observe how the overall effect size varied.

Results

Study characteristics

The initial search identified 199,125 articles, of which 259 full-text articles were obtained and further evaluated. Eventually, 54 studies met all the criteria and were included in the final analysis. A total of 5281 children and adolescents comprised the interventional group, and 4794 participants comprised the control group, aged between 0 and 18 years. Meanwhile, 5321 and 4834 caregivers comprised the intervention and control groups, respectively. The participants were from 18 countries, including 3 in Asia, 12 in Europe, 32 in North America, 1 in South America, 5 in Oceania, and 1 in multiple countries. The children in the 54 studies were diagnosed with the following disorders: chronic conditions ($n = 1$), asthma ($n = 26$), diabetes ($n = 10$), cancer ($n = 5$), hypersensitivity (e.g., atopic eczema, atopic dermatitis) ($n = 6$), cerebral palsy ($n = 3$), arthritis ($n = 2$), and sickle cell disease ($n = 1$). Of these studies, 30 reported on the QoL of the children, another 15 focused on the QoL of the caregivers, and 9 included the QoL of both the caregivers and children. Among the 54 studies, 30 were conducted in hospitals, 17 were performed in homes, 2 were carried out in schools, and 1 was conducted in community settings. Additionally, three studies used both hospitals and homes [29, 41, 42] and one used both school and home settings [43] to perform the interventions. The interventions mainly involved education on disease and symptom management ($n = 38$, 70%), skill training, environment, psychological intervention, physical exercise, experience sharing, monitoring, or social support. These interventions focused on caregivers only; caregivers and children; or caregivers, children, and other family members. We categorized the structure and components of the interventions based on their characteristics: 88.89% of the studies provided intervention through a face-to-face mode, 40.74% of the studies offered group intervention, and 24.0% administered nurse-led interventions. The control groups usually utilized usual care, educational material delivery intervention, or wait-list control. Table 2 shows the detailed characteristics of the included RCTs.

Quality assessment

In general, all studies were deemed to be of moderate quality, as shown in Table 2. Although all studies mentioned randomization, 12 studies did not provide detailed descriptions and, thus were judged as unclear [29, 44–54]. Only one of the included studies adopted blinding of participants [55]. 21 studies described allocation concealment [21, 23, 26–28, 30, 32–36, 42, 46, 56–63]. Meanwhile, 23 studies included all of the participants in the analysis [22–24, 31, 32, 35, 41, 42, 48, 50, 55–58, 60, 63–70]. Moreover, 11 studies blindly assessed the outcomes [21, 30, 35, 36, 41, 60, 66, 70–73]. Furthermore, most studies were judges as "yes" in terms of the criteria of baseline comparability, same treatment and measurement, measurement reliability, and appropriate statistical analysis. The sensitivity analyses iteratively removing one study at a time did not influence the significance for all of the models in our study (Online Resource 1). Detailed quality assessment is presented in Table 3.

Meta-analysis results

The data on the QoL of children, caregivers, and both caregivers and children were analyzed in our review. Table 4 presents the summary of the meta-analysis findings. The forest and funnel plots, and sensitivity analyses are given in Online Resource 1. Moreover, the meta-regression table is shown in Online Resource 2.

Effects of caregiver-involved interventions on the QoL of the children

Thirty studies including 4054 children with chronic diseases were incorporated into the analysis to pool the effects of the caregiver-involved interventions on the QoL of the children, with 4 using measures reporting general QoL [22, 47, 57, 74], and 22 using measures reporting HRQoL [23–26, 29, 30, 32–36, 43, 46, 52, 54, 55, 63, 67, 70, 73, 75, 76], and 4 using both measurements [21, 31, 41, 77]. There were 3

Table 3 Quality assessment of included studies

Study	Random assignment	Blinding of participants	Allocation concealment	Outcome data completion	Blinding of assessment	Baseline comparability	Same treatment	Same measurement	Measurement reliability	Appropriate statistical analysis
Ambrosino et al. [33]	Yes	No	Yes	No	Unclear	Yes	Yes	Yes	Yes	Yes
Barrera et al. [55]	Yes	Yes	No	Yes	Unclear	Yes	Yes	Yes	Yes	Yes
Brown et al. [44]	Unclear	No	Unclear	No	No	No	Yes	Yes	Unclear	Yes
Butz et al. [45]	Unclear	No	Unclear	No	No	Yes	Yes	Yes	Yes	No[a]
Campbell et al. [56]	Yes	No	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes
Canino et al. [64]	Yes	No	Unclear	Yes	Unclear	No	Yes	Yes	Yes	Yes
Cano-Garcinuño et al. [65]	Yes	No	No	Yes	Unclear	Yes	Unclear	Yes	Yes	No[a]
Chan et al. [78]	Yes	No	No	No	Unclear	No	Yes	Yes	Yes	No[a]
Chinn et al. [24]	Yes	No	No	Yes	Unclear	Unclear	Unclear	Yes	Yes	Yes
Daniel et al. [57]	Yes	No	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes
Deschildre et al. [46]	Unclear	No	Yes	No	No	No	Yes	Yes	Yes	Yes
Farrokhnia et al. [47]	Unclear	No	Unclear	Unclear	No	Unclear	Yes	Yes	Yes	Yes
Fiks et al. [34]	Yes	No	Yes	No	Unclear	Yes	Yes	Yes	Yes	Yes
Flores et al. [66]	Yes	No	Unclear	Yes	Yes	No	Yes	Yes	Yes	No[a]
Garbutt et al. [58]	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	No[a]
Garbutt et al. [59]	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes
Ghodsbin et al. [48]	Unclear	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Yes	Yes
Graue et al. [25]	Yes	No	Unclear	No	No	Yes	Yes	Yes	Yes	Yes
Grey et al. [35]	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Grey et al. [60]	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Grillo et al. [67]	Yes	No	No	Yes	Unclear	Unclear	Unclear	Yes	Yes	Yes
Hederos et al. [49]	Unclear	No	Unclear	No	No	Yes	Yes	Yes	Yes	Yes
Horner and Brown [43]	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes
Hsin et al. [36]	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Jaser et al. [75]	Yes	No	Unclear	No	Unclear	No	Yes	Yes	Yes	Yes
Kamps et al. [68]	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	No[a]
Katz et al. [22]	Yes	No	Unclear	Yes	Unclear	No	Yes	Yes	Yes	Yes
Khan et al. [71]	Yes	No	No	No	Yes	No	Yes	Yes	Yes	Yes
Kichler et al. [77]	Yes	No	Unclear	No	Unclear	No	Yes	Yes	Yes	Yes
Kieckhefer et al. [69]	Yes	No	Unclear	Yes	Unclear	No	Yes	Yes	Yes	Yes
Krieger et al. [61]	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes
Krieger et al. [42]	Yes	No	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Krishna et al. [50]	Unclear	No	Unclear	Yes	No	Yes	Yes	Yes	Yes	No[a]
Laffel et al. [74]	Yes	No	Unclear	No	Unclear	No	Yes	Yes	Yes	Yes
Lomholt et al. [31]	Yes	No	Unclear	Yes	Unclear	Yes	Yes	Yes	Yes	Yes

Table 3 (continued)

Study	Random assignment	Blinding of participants	Allocation concealment	Outcome data completion	Blinding of assessment	Baseline comparability	Same treatment	Same measurement	Measurement reliability	Appropriate statistical analysis
Marchese et al. [41]	Yes	No	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes
McGhan et al. [76]	Yes	No	No	No	Unclear	No	Yes	Yes	Yes	Yes
Murphy et al. [32]	Yes	No	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes
Revel and Baynouna [51]	Unclear	No	Unclear	No	Unclear	No	Unclear	Yes	Yes	No[a]
Rice et al. [70]	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Seid et al. [21]	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Shaw et al. [26]	Yes	No	Yes	No	No	No	Unclear	Yes	Yes	Yes
Sockrider et al. [52]	Unclear	No	Unclear	No	Unclear	Yes	Yes	Yes	Yes	Yes
Staab et al. [53]	Unclear	No	Unclear	No	Unclear	Yes	Yes	Yes	Yes	Yes
Staab et al. [27]	Yes	No	Yes	No	Unclear	Yes	Yes	Yes	Yes	Yes
Stevens et al. [62]	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Stinson et al. [63]	Yes	No	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes
Tanir and Kuguoglu [29]	Unclear	No	Unclear	No	Unclear	No	Yes	Yes	Yes	Yes
Tiberg et al. [28]	Yes	No	Yes	No	Unclear	Yes	Yes	Yes	Yes	Yes
Valery et al. [72]	Yes	No	No	No	Yes	No	Yes	Yes	Yes	No[a]
Walders et al. [73]	Yes	No	Unclear	No	Yes	Yes	Yes	Yes	Yes	Yes
Weber et al. [54]	Unclear	No	Unclear	No	Unclear	Yes	Unclear	Yes	Yes	Yes
Wely et al. [30]	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Whittingham et al. [23]	Yes	No	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes

[a]Studies using a group-based intervention did not assess the clustering effect of the group

Table 4 Summary of meta-analytic results for QoL

Outcome	*n*	*N*	I^2 (%)	SMD	95% CI	*Z*	*p*
QoL of children	8	711	30	0.00	−0.22, 0.22	0.00	1.00
HRQoL of children	26	3672	8	0.06	−0.02, 0.14	1.39	0.16
HRQoL of caregivers	13	4183	66	0.26	0.14, 0.38	4.12	< 0.001
With face-to-face mode	11	2925	36	0.32	0.21, 0.43	5.89	< 0.001
Without face-to-face mode	2	1258	0	0.00	−0.12, 0.12	0.00	1.00
HRQoL of caregivers + children	9	1754	30	0.04	−0.08, 0.17	0.64	0.52

n studies included, *N* children included in the study, *QoL* quality of life, *HRQoL* health-related quality of life, *SMD* standardized mean difference, *CI* confidence interval

studies targeting to caregivers only [23, 34, 55], and 27 targeted to both caregivers and children. The results indicated that caregiver-involved interventions were not beneficial in improving both the QoL (SMD = 0.00, 95% CI −0.22 to 0.22, $Z = 0.00$, $p = 1.00$) and HRQoL (SMD = 0.06, 95% CI −0.02 to 0.14, $Z = 1.39$, $p = 0.16$) of children, with a low heterogeneity across the studies ($I^2 = 30\%$ and 8%, respectively). Neither Egger's test ($p = 0.08$) nor Begg and Mazumdar's rank correlation test ($p = 0.09$) suggested a publication bias for studies evaluating the HRQoL of children. Meta-regressions were performed to explore the factors regulating the effect of the intervention across these studies. The univariate meta-regression revealed that only the setting of the intervention ($p = 0.035$) was statistically significant, and the intervention conducted in hospital was more positively for the HRQoL of children.

Effects of caregiver-involved interventions on the QoL of the caregivers

Fifteen studies including 4323 caregivers of children with chronic diseases were incorporated into the analysis to pool the effects of the interventions on the QoL of the caregivers, with 14 using measures reporting HRQoL [27, 42, 44, 48, 49, 53, 56, 59–62, 64, 69, 71], and only 1 using measures reporting QoL [28]. Furthermore, only one study [48] targeting at parents having children with leukemia, and a significant heterogeneity was observed between this study and the others. As a result, we analyzed these two unique studies separately (60 and 80 caregivers, respectively). Tiberg et al. [42] examined the effect of hospital-based home care on QoL in caregivers of children with diabetes. They found that hospital-based home care significantly improved caregivers' QoL compared with usual care. .Ghodsbin et al. [62] assessed the effect of 2-month education on HRQoL in caregivers of children with leukemia. They found that the educational intervention improved family caregivers' HRQoL. The results of the remaining 13 studies showed that caregiver-involved interventions had significant effects on the HRQoL of the caregivers (SMD = 0.26, 95% CI 0.14–0.38, $Z = 4.12$, $p < 0.001$), with a high between-studies heterogeneity ($I^2 = 66\%$). Both Egger's test ($p = 0.17$) and Begg and Mazumdar's rank correlation test ($p = 0.46$) indicated that a publication bias did not likely exist. Meta-regressions were performed to explore the potential sources of heterogeneity and factors regulating the effect of the intervention across these studies. The univariate meta-regression revealed that the length of the intervention ($p = 0.021$), group intervention ($p = 0.029$), and face-to-face mode ($p = 0.002$) were statistically significant. However, the multivariable meta-regression found that only the face-to-face mode ($p = 0.026$) was associated with the heterogeneity.

Subsequently, we divided the HRQoL of the caregivers into two subgroups (with vs. without face-to-face mode) based on the results of the meta-regression. 11 studies (2925 caregivers) were included in the subgroup with face-to-face mode [27, 42, 44, 49, 53, 56, 60–62, 64, 69]. Meanwhile, two studies (1258 caregivers) were included in the subgroup without face-to-face mode [59, 71]. The meta-analysis results showed that caregiver-involved interventions delivered through the face-to-face mode improved the HRQoL of the caregivers ($I^2 = 36\%$, SMD = 0.32, 95% CI 0.21–0.43, $Z = 5.89$, $p < 0.001$). In contrast, those that were not delivered through the face-to-face mode did not improve the QoL of the caregivers ($I^2 = 0\%$, SMD = 0.00, 95% CI −0.12 to 0.12, $Z = 0.00$, $p = 1.00$).

Effects of caregiver-involved interventions on the QoL of both caregivers and children

Nine studies including 1754 children and 1754 caregivers were incorporated into the analysis to pool the effects of the interventions on the QoL of both caregivers and children, all of which used HRQoL measures [45, 50, 51, 58, 65, 66, 68, 72, 78]. We found that family-based interventions do not have an effect on the QoL of both caregivers and children (SMD = 0.04, 95% CI −0.08 to 0.17, $Z = 0.64$, $p = 0.52$), with an acceptable heterogeneity across studies ($I^2 = 30\%$).

Discussion

Summary of findings

This systematic review and meta-analysis aimed to comprehensively evaluate the effects of caregiver-involved interventions in RCTs on the QoL of pediatric patients with chronic diseases and their caregivers and provide evidence to clinicians and researchers with regard to the efficacy of these interventions. To our knowledge, this meta-analysis is the first to evaluate the efficacy of caregiver-involved interventions for families with chronically ill children that was exclusively focused on the QoL as the outcome. In total, 54 RCTs were included in this meta-analysis, all of which were rated as moderate quality. Most studies conducted educational interventions. The remaining studies administered a wide range of interventions, including skill training, environment changing, psychological therapy, physical exercise, experience sharing, home monitoring, and social support. Moreover, 42 included studies performed interventions that involved both the caregiver and child. In these studies, the length of the caregiver-involved interventions varied from 15 min [26] to 15 months [25]. Furthermore, the QoL outcomes were measured at different time points, ranging from post treatment [23, 47] to 72 months [49]. Nevertheless, relevant studies on some diseases (e.g., hematologic diseases, brain concussion, cystic fibrosis, epilepsy, frequent headache, craniocerebral trauma, heart diseases, migraine disorders, and muscular dystrophies) were not found in our analysis, which suggested that this research area is still novel and needs to be explored constantly. The findings of our study may contribute to realize the components and delivery mode of caregiver-involved interventions and their relative influence on the QoL of chronically ill children and their caregivers.

Notably, most studies utilized interventions that aimed to deliver knowledge on the disease and its management to families of children with chronic diseases. And 11 out of 13 studies targeting on parents included in the meta-analysis showing improved caregivers' HRQoL provided disease knowledge. This finding suggested that family education which is an effective way to improve caregivers' outcomes should be viewed as a fundamental part of chronic disease care in clinical practice [79, 80]. However, the findings of meta-regression indicated that family education was not a significant factor to have a positive effect on improving the HRQoL of the children and their caregivers. Thus, further research focus on the delivery mode, type, dose of parenting education, developing effective education measures is necessary for families with chronically ill children.

Numerous surveys have shown that the QoL of children with chronic conditions and their caregivers are generally poor [81–83]. The findings from our review indicated that caregiver-involved interventions had a significant effect on the HRQoL of the caregivers, particularly when these programs were delivered face to face. Some caregivers felt that they were not able to understand the medical issues [84]. This lack of understanding often left the caregivers ill-equipped to deal with the conditions and participate in decision making [84]. To that end, face-to-face information delivery mode can provide a supportive environment for families in which discussions with clinicians about the caregivers' specific aspirations, care management, and areas of priorities that they need help with can take place. Furthermore, clinicians can also engage caregivers in discussion on what the improvement of comfort and QoL of the children means. Therefore, successful interventions involving specific information of disease management and contemporary daily life stressors experienced by these caregivers should be delivered through face-to-face mode so that the QoL of the caregivers can be improved [85]. In general, improvements in the child's condition are reported to be strongly linked to the parents' satisfaction with care tasks [6, 7]. The finding in our study also suggests that caregiver-involved interventions are essential for families with chronically ill children. The manner in which a family copes with the care tasks will affect the QoL of not only the parents but also all family members [86].

Interestingly, the study of Ghodsbin et al. [48] showed obviously higher effect size than the other studies on the QoL of the caregivers. This difference can be mainly attributed to the study population, which includes children with leukemia, and unclear treatments in the control group. Unlike other chronic diseases, leukemia has greater threat to the child's life, which results in more challenges to caregivers, thus seriously affecting their QoL. Therefore, programs provided to caregivers with children who had leukemia can have significant results. However, owing to insufficient data, this evidence is difficult to exactly generalize.

Furthermore, the results in our study showed that studies targeting the overall QoL were much less than those targeting the HRQoL of children and their caregivers. Therefore, further research focused on the overall QoL is needed, since the overall QoL seems to be an important outcome for families with pediatric patients [13].

Strengths and limitations

This meta-analysis has a few strengths. First, RCTs focusing on a broad range of caregiver-involved interventions were rigorously and thoroughly searched in our study. Second, we have conducted meta-regressions to explore the potential moderators for the effects of caregiver-involved interventions.

Despite its strengths, our review has several obvious limitations to consider when interpreting the results. First, the

search yielded approximately 200,000 articles, which made it very easy to make mistakes and the review may have missed articles that would have met criteria. In addition, considerable heterogeneity in chronic conditions, patients, interventions, etc., was another limitation. Although we used meta-regression to deal with this limitation, it is still possible that certain effects are diluted due to the heterogeneity. Finally, the overall quality of the included studies was moderate, with just 1 study mentioning blinding of participants and 11 studies mentioning blinding assessment. Thus, more high-quality RCTs on caregiver-involved interventions for children and adolescents with chronic conditions should be conducted.

Conclusion

The findings from this meta-analysis contributed to the deeper understanding of the components and delivery modes of caregiver-involved intervention. In particular, these findings may prompt clinicians to provide face-to-face mode interventions to the family of children with chronic diseases. The results of this analysis suggested that caregivers should be provided with medical information and tools to cope with the disease management demands, their children's changing needs and detect trends on strategies that provide the best possible QoL for their ill children and their families. However, further research in this field remains to be conducted. The identification of factors that could possibly affect the QoL of both the children and caregivers and contexts that influenced the effects of the interventions on any of the dimensions that determine QoL is necessary.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interests.

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

References

1. Perrin, J. M., Bloom, S. R., & Gortmaker, S. L. (2007). The increase of childhood chronic conditions in the United States. *JAMA, 297*(24), 2755–2759.
2. Cousino, M. K., & Hazen, R. A. (2013). Parenting stress among caregivers of children with chronic illness: A systematic review. *Journal of Pediatric Psychology, 38*(8), 809–828.
3. Graziano, S., Rossi, A., Spano, B., Petrocchi, M., Biondi, G., & Ammaniti, M. (2016). Comparison of psychological functioning in children and their mothers living through a life-threatening and non life-threatening chronic disease: A pilot study. *Journal of Child Health Care, 20*(2), 174–184.
4. Guillamon, N., Nieto, R., Pousada, M., Redolar, D., Munoz, E., Hernandez, E., et al. (2013). Quality of life and mental health among parents of children with cerebral palsy: The influence of self-efficacy and coping strategies. *Journal of Clinical Nursing, 22*(11–12), 1579–1590.
5. Fortin, K., Pries, E., & Kwon, S. (2016). Missed medical appointments and disease control in children with type 1 diabetes. *Journal of Pediatric Health Care, 30*(4), 381–389.
6. Hudson, S. M., Newman, S. D., Hester, W. H., Magwood, G. S., Mueller, M., & Laken, M. A. (2014). Factors influencing hospital admissions and emergency department visits among children with complex chronic conditions: A qualitative study of parents' and providers' perspectives. *Issues in Comprehensive Pediatric Nursing, 37*(1), 61–80.
7. Leeman, J., Crandell, J. L., Lee, A., Bai, J., Sandelowski, M., & Knafl, K. (2016). Family functioning and the well-being of children with chronic conditions: A meta-analysis. *Research in Nursing & Health, 39*(4), 229–243.
8. Eccleston, C., Fisher, E., Law, E., Bartlett, J., & Palermo, T. M. (2015). Psychological interventions for parents of children and adolescents with chronic illness. *Cochrane Database Systematic Review 4*, CD009660.
9. Bellin, M. H., Kub, J., Frick, K. D., Bollinger, M. E., Tsoukleris, M., Walker, J., et al. (2013). Stress and quality of life in caregivers of inner-city minority children with poorly controlled asthma. *Journal of Pediatric Health Care, 27*(2), 127–134.
10. Defenderfer, E. K., Rybak, T. M., Davies, W. H., & Berlin, K. S. (2017). Predicting parent health-related quality of life: Evaluating conceptual models. *Quality of Life Research, 26*(6), 1405–1415.
11. Emerson, N. D., Distelberg, B., Morrell, H. E., Williams-Reade, J., Tapanes, D., & Montgomery, S. (2015). Quality of life and cchool absenteeism in children with chronic illness. *Journal of School Nursing, 32*(4), 258–266.
12. Macedo, E. C., Da, S. L., Paiva, M. S., & Ramos, M. N. (2015). Burden and quality of life of mothers of children and adolescents with chronic illnesses: An integrative review. *Revista Latino-Americana de Enfermagem, 23*(4), 769–777.
13. Ronen, G. M., Fayed, N., & Rosenbaum, P. L. (2011). Outcomes in pediatric neurology: A review of conceptual issues and recommendationsThe 2010 Ronnie Mac Keith Lecture. *Developmental Medicine & Child Neurology, 53*(4), 305–312.
14. Law, E. F., Fisher, E., Fales, J., Noel, M., & Eccleston, C. (2014). Systematic review and meta-analysis of parent and family-based interventions for children and adolescents with chronic medical conditions. *Journal of Pediatric Psychology, 39*(8), 866–886.
15. Welsh, E. J., Hasan, M., & Li, P. (2011). Home-based educational interventions for children with asthma. *Cochrane Database Systematic Review, 10*, CD008469.
16. Epstein, I., Stinson, J., & Stevens, B. (2005). The effects of camp on health-related quality of life in children with chronic illnesses: A review of the literature. *Journal of Pediatric Oncology Nursing, 22*(2), 89–103.
17. McGrady, M. E., Ryan, J. L., Gutierrez-Colina, A. M., Fredericks, E. M., Towner, E. K., & Pai, A. L. (2015). The impact of effective paediatric adherence promotion interventions: Systematic review and meta-analysis. *Child: Care, Health and Development, 41*(6), 789–802.
18. Mitchell, T., & Barlow, C. E. (2011). Review of the role of exercise in improving quality of life in healthy individuals and in those with chronic diseases. *Current Sports Medicine Reports, 10*(4), 211–216.

19. Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., et al. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Systematic Review, 4*, 1.
20. Zhou, L., Liu, X. L., Tan, J. Y., Yu, H. P., Pratt, J., & Peng, Y. Q. (2015). Nurse-led educational interventions on cancer pain outcomes for oncology outpatients: A systematic review. *International Nursing Review, 62*(2), 218–230.
21. Seid, M., Varni, J. W., Gidwani, P., Gelhard, L. R., & Slymen, D. J. (2010). Problem-solving skills training for vulnerable families of children with persistent asthma: Report of a randomized trial on health-related quality of life outcomes. *Journal of Pediatric Psychology, 35*(10), 1133–1143.
22. Katz, M. L., Volkening, L. K., Butler, D. A., Anderson, B. J., & Laffel, L. M. (2014). Family-based psychoeducation and care ambassador intervention to improve glycemic control in youth with type 1 diabetes: A randomized trial. *Pediatric Diabetes, 15*(2), 142–150.
23. Whittingham, K., Sanders, M. R., Mckinlay, L., & Boyd, R. N. (2015). Parenting intervention combined with acceptance and commitment therapy: A trial with families of children with cerebral palsy. *Journal of pediatric Psychology*. https://doi.org/10.1093/jpepsy/jsv118.
24. Chinn, D., Poyner, T., & Sibley, G. (2002). Randomized controlled trial of a single dermatology nurse consultation in primary care on the quality of life of children with atopic eczema. *The British Journal of Dermatology, 146*(3), 432–439.
25. Graue, M., Wentzel-Larsen, T., Hanestad, B. R., & Sovik, O. (2005). Evaluation of a programme of group visits and computer-assisted consultations in the treatment of adolescents with type 1 diabetes. *Diabetic Medicine, 22*(11), 1522–1529.
26. Shaw, M., Morrell, D. S., & Goldsmith, L. A. (2008). A study of targeted enhanced patient care for pediatric atopic dermatitis (STEP PAD). *Pediatric Dermatology, 25*(1), 19–24.
27. Staab, D., Diepgen, T. L., Fartasch, M., Kupfer, J., Lob-Corzilius, T., Ring, J., et al. (2006). Age related, structured educational programmes for the management of atopic dermatitis in children and adolescents: Multicentre, randomised controlled trial. *BMJ, 332*(7547), 933–938.
28. Tiberg, I., Hallström, I., Jönsson, L., & Carlsson, A. (2014). Comparison of hospital-based and hospital-based home care at diabetes onset in children. *European Diabetes Nursing, 11*(3), 70–74.
29. Tanir, M. K., & Kuguoglu, S. (2013). Impact of exercise on lower activity levels in children with acute lymphoblastic leukemia: A randomized controlled trial from turkey. *Rehabilitation Nursing, 38*(1), 48–59.
30. Wely, L. V., Balemans, A. C. J., Becher, J. G., & Dallmeijer, A. J. (2014). The effectiveness of a physical activity stimulation programme for children with cerebral palsy on social participation, self-perception and quality of life: A randomized controlled trial. *Clinical Rehabilitation, 28*(10), 972–982.
31. Lomholt, J. J., Thastum, M., Christensen, A. E., Leegaard, A., & Herlin, T. (2015). Cognitive behavioral group intervention for pain and well-being in children with juvenile idiopathic arthritis: A study of feasibility and preliminary efficacy. *Pediatric Rheumatology, 13*, 35.
32. Murphy, H. R., Wadham, C., Hassler-Hurst, J., Rayman, G., & Skinner, T. C. (2012). Randomized trial of a diabetes self-management education and family teamwork intervention in adolescents with type 1 diabetes. *Diabetic Medicine, 29*(8), e249–e254.
33. Ambrosino, J. M., Fennie, K., Whittemore, R., Jaser, S., Dowd, M. F., & Grey, M. (2008). Short-term effects of coping skills training in school-age children with type 1 diabetes. *Pediatric Diabetes, 9*(32), 74–82.
34. Fiks, A. G., Mayne, S. L., Karavite, D. J., Suh, A., O'Hara, R., Localio, A. R., et al. (2015). Parent-reported outcomes of a shared decision-making portal in asthma: A practice-based RCT. *Pediatrics, 135*(4), e965–e973.
35. Grey, M., Whittemore, R., Jaser, S., Ambrosino, J., Lindemann, E., Liberti, L., et al. (2009). Effects of coping skills training in school-agecChildren with type 1 diabetes. *Research in Nursing & Health, 32*(4), 405–418.
36. Hsin, Y., Chen, F., Lin, K., Kang, L., Chen, C., & Chen, C. (2012). Efficacy of constraint-induced therapy on functional performance and health-related quality of life for children with cerebral palsy: A randomized controlled trial. *Journal of Child Neurology, 27*(8), 992–999.
37. Borenstein, M., Hedges, L., Higgins, J., & Rothstein, H. (2009). *Introduction to meta-analysis*. Chichester: Wiley.
38. Higgins, J., & Green, S. (Eds.) (2011). *Cochrane handbook for systematic reviews of interventions version 5.1.0*. Accessed June 25, 2016, from http://handbook-5-1.cochrane.org/.
39. Egger, M., Davey, S. G., Schneider, M., & Minder, C. (1997). Bias in meta-analysis detected by a simple, graphical test. *BMJ Journals, 315*(7109), 629–634.
40. Begg, C. B., & Mazumdar, M. (1994). Operating characteristics of a rank correlation test for publication bias. *Biometrics, 50*(4), 1088–1101.
41. Marchese, V. G., Chiarello, L. A., & Lange, B. J. (2004). Effects of physical therapy intervention for children with acute lymphoblastic leukemia. *Pediatric Blood & Cancer, 42*(2), 127–133.
42. Krieger, J., Takaro, T. K., Song, L., Beaudet, N., & Edwards, K. (2009). A randomized controlled trial of asthma self-management support comparing clinic-based nurses and in-home community health workers: The Seattle-King County Healthy Homes II Project. *Archives of Pediatrics and Adolescent Medicine, 163*(2), 141–149.
43. Horner, S. D., & Brown, A. (2014). Evaluating the effect of an asthma self-management intervention for rural families. *Journal of Asthma, 51*(2), 168–177.
44. Brown, J. V., Bakeman, R., Celano, M. P., Demi, A. S., Kobrynski, L., & Wilson, S. R. (2002). Home-based asthma education of young low-income children and their families. *Journal of Pediatric Psychology, 27*(8), 677–688.
45. Butz, A., Pham, L., Lewis, L., Lewis, C., Hill, K., Walker, J., et al. (2005). Rural children with asthma: Impact of a parent and child asthma education program. *Journal of Asthma, 42*(10), 813–821.
46. Deschildre, A., Beghin, L., Salleron, J., Iliescu, C., Thumerelle, C., Santos, C., et al. (2012). Home telemonitoring (forced expiratory volume in 1 s) in children with severe asthma does not reduce exacerbations. *European Respiratory Journal, 39*(2), 290–296.
47. Farrokhnia, M., Shahidi, S., & Fathabadi, J. (2013). The impact of cognitive interventions in reducing intensity of pain and distress, and improving quality of life of children with cancer. *Basic & Clinical Cancer Research, 5*(3), 16–22.
48. Ghodsbin, F., Asadi, N., Javanmardi, F. S., & Kamali, M. (2014). Effect of education on quality of life of family caregivers of children with leukemia referred to the Oncology Clinic at Kerman's Afzali-Poor Hospital (Iran), 2012. *Investigación y Educación en Enfermería, 32*(1), 41–48.
49. Hederos, C. A., Janson, S., & Hedlin, G. (2009). Six-year follow-up of an intervention to improve the management of preschool children with asthma. *Acta Paediatrica, 98*(12), 1939–1944.
50. Krishna, S., Francisco, B. D., Balas, E. A., Konig, P., Graff, G. R., & Madsen, R. W. (2003). Internet-enabled interactive multimedia asthma education program: A randomized trial. *Pediatrics, 111*(3), 503–510.
51. Revel, A., & Baynouna, L. (2012). Implementing quality improvement intervention of pediatric asthma in primary health care-Al Ain, United Arab Emirates: A randomized controlled study. *Journal of Asthma and Allergy Educators, 3*(1), 20–26.

52. Sockrider, M. M., Abramson, S., Brooks, E., Caviness, A. C., Pilney, S., Koerner, C., et al. (2006). Delivering tailored asthma family education in a pediatric emergency department setting: A pilot study. *Pediatrics, 117*(4 Pt2), S135–S144.
53. Staab, D., von Rueden, U., Kehrt, R., Erhart, M., Wenninger, K., Kamtsiuris, P., et al. (2002). Evaluation of a parental training program for the management of childhood atopic dermatitis. *Pediatric Allergy and Immunology, 13*(2), 84–90.
54. Weber, M., Fontes, N. P. T., Prati, C., Soirefman, M., Mazzotti, N., Barzenski, B., et al. (2008). Improvement of pruritus and quality of life of children with atopic dermatitis and their families after joining support groups. *Journal of the European Academy of Dermatology and Venereology: JEADV, 22*(8), 992–997.
55. Barrera, M., Hancock, K., Rokeach, A., Atenafu, E., Cataudella, D., Punnett, A., et al (2014). Does the use of the revised Psychosocial Assessment Tool (PATrev) result in improved quality of life and reduced psychosocial risk in Canadian families with a child newly diagnosed with cancer? *Psycho-Oncology, 23*(2), 165–172.
56. Campbell, J. D., Brooks, M., Hosokawa, P., Robinson, J., Song, L., & Krieger, J. (2015). Community health worker home visits for medicaid-enrolled children with asthma: Effects on asthma outcomes and costs. *American Journal of Public Health, 105*(11), 2366–2372.
57. Daniel, L. C., Li, Y., Smith, K., Tarazi, R., Robinson, M. R., Patterson, C. A., et al. (2015). Lessons learned from a randomized controlled trial of a family-based intervention to promote school functioning for school-age children with sickle cell disease. *Journal of Pediatric Psychology, 40*(10), 1085–1094.
58. Garbutt, J. M., Banister, C., Highstein, G., Sterkel, R., Epstein, J., Bruns, J., et al. (2010). Telephone coaching for parents of children with asthma: Impact and lessons learned. *Archives of Pediatrics and Adolescent Medicine, 164*(7), 625–630.
59. Garbutt, J. M., Yan, Y., Highstein, G., & Strunk, R. C. (2015). A cluster-randomized trial shows telephone peer coaching for parents reduces children's asthma morbidity. *Journal of Allergy and Clinical Immunology, 135*(5), 1163–1170.
60. Grey, M., Jaser, S. S., Whittemore, R., Jeon, S., & Lindemann, E. (2011). Coping skills training for parents of children with type 1 diabetes. *Nursing Research, 60*(3), 173–181.
61. Krieger, J. W., Takaro, T. K., Song, L., & Weaver, M. (2005). The Seattle-King County Healthy Homes Project: A randomized, controlled trial of a community health worker intervention to decrease exposure to indoor asthma triggers. *American Journal of Public Health, 95*(4), 652–659.
62. Stevens, C. A., Wesseldine, L. J., Couriel, J. M., Dyer, A. J., Osman, L. M., & Silverman, M. (2002). Parental education and guided self-management of asthma and wheezing in the preschool child: A randomised controlled trial. *Thorax, 57*(1), 39–44.
63. Stinson, J. N., McGrath, P. J., Hodnett, E. D., Feldman, B. M., Duffy, C. M., Huber, A. M., et al. (2010). An Internet-based self-management program with telephone support for adolescents with arthritis: A pilot randomized controlled trial. *Journal of Rheumatology, 37*(9), 1944–1952.
64. Canino, G., Vila, D., Normand, S. L., Acosta-Perez, E., Ramirez, R., Garcia, P., et al. (2008). Reducing asthma health disparities in poor Puerto Rican children: The effectiveness of a culturally tailored family intervention. *The Journal of Allergy and Clinical Immunology, 121*(3), 665–670.
65. Cano-Garcinuno, A., Diaz-Vazquez, C., Carvajal-Uruena, I., Praena-Crespo, M., Gatti-Vinoly, A., & Garcia-Guerra, I. (2007). Group education on asthma for children and caregivers: A randomized, controlled trial addressing effects on morbidity and quality of life. *Journal of Investigational Allergology and Clinical Immunology, 17*(4), 216–226.
66. Flores, G., Bridon, C., Torres, S., Perez, R., Walter, T., Brotanek, J., et al. (2009). Improving asthma outcomes in minority children: A randomized, controlled trial of parent mentors. *Pediatrics, 124*(6), 1522–1532.
67. Grillo, M., Ng, M., Gassner, L., Marshman, G., Dunn, S., & Hudson, P. (2006). Pediatric atopic eczema: The impact of an educational intervention. *Pediatric Dermatology, 23*(5), 428–436.
68. Kamps, A. W., Brand, P. L., Kimpen, J. L., Maille, A. R., Overgoor-van, D. G. A., van Helsdingen-Peek, L. C., et al. (2003). Outpatient management of childhood asthma by paediatrician or asthma nurse: Randomised controlled study with one year follow up. *Thorax, 58*(11), 968–973.
69. Kieckhefer, G., Trahms, C., Churchill, S., Kratz, L., Uding, N., & Villareale, N. (2014). A randomized clinical trial of the building on family strengths program: An education program for parents of children with chronic health conditions. *Maternal & Child Health Journal, 18*(3), 563–574.
70. Rice, J. L., Matlack, K. M., Simmons, M. D., Steinfeld, J., Laws, M. A., Dovey, M. E., et al. (2015). LEAP: A randomized-controlled trial of a lay-educator inpatient asthma education program. *Patient Education and Counseling, 98*(12), 1585–1591.
71. Khan, M. S., O'Meara, M., Stevermuer, T. L., & Henry, R. L. (2004). Randomized controlled trial of asthma education after discharge from an emergency department. *Journal of Paediatrics and Child Health, 40*(12), 674–677.
72. Valery, P. C., Masters, I. B., Taylor, B., Laifoo, Y., O'Rourke, P. K., & Chang, A. B. (2010). An education intervention for childhood asthma by Aboriginal and Torres Strait Islander health workers: A randomised controlled trial. *Medical Journal of Australia, 192*(10), 574–579.
73. Walders, N., Kercsmar, C., Schluchter, M., Redline, S., Kirchner, H. L., & Drotar, D. (2006). An interdisciplinary intervention for undertreated pediatric asthma. *Chest, 129*(2), 292–299.
74. Laffel, L. M., Vangsness, L., Connell, A., Goebel-Fabbri, A., Butler, D., & Anderson, B. J. (2003). Impact of ambulatory, family-focused teamwork intervention on glycemic control in youth with type 1 diabetes. *Journal of Pediatrics, 142*(4), 409–416.
75. Jaser, S. S., Patel, N., Rothman, R. L., Choi, L., & Whittemore, R. (2014). Check it! A randomized pilot of a positive psychology intervention to improve adherence in adolescents with type 1 diabetes. *The Diabetes Educator, 40*(5), 659–667.
76. McGhan, S. L., Wong, E., Sharpe, H. M., Hessel, P. A., Mandhane, P., Boechler, V. L., et al. (2010). A children's asthma education program: Roaring Adventures of Puff (RAP), improves quality of life. *Canadian Respiratory Journal, 17*(2), 67–73.
77. Kichler, J. C., Kaugars, A. S., Marik, P., Nabors, L., & Alemzadeh, R. (2013). Effectiveness of groups for adolescents with type 1 diabetes mellitus and their parents. *Families, Systems & Health, 31*(3), 280–293.
78. Chan, D. S., Callahan, C. W., Hatch-Pigott, V. B., Lawless, A., Proffitt, H. L., Manning, N. E., et al. (2007). Internet-based home monitoring and education of children with asthma is comparable to ideal office-based care: Results of a 1-year asthma in-home monitoring trial. *Pediatrics, 119*(3), 569–578.
79. Clarke, S. A., & Calam, R. (2012). The effectiveness of psychosocial interventions designed to improve health-related quality of life (HRQOL) amongst asthmatic children and their families: A systematic review. *Quality of Life Research, 21*(5), 747–764.
80. Trollvik, A., Ringsberg, K. C., & Silen, C. (2013). Children's experiences of a participation approach to asthma education. *Journal of Clinical Nursing, 22*(7–8), 996–1004.
81. Samardzic, M., Tahirovic, H., Popovic, N., & Popovic-Samardzic, M. (2016). Health-related quality of life in children and adolescents with type 1 diabetes mellitus from Montenegro: Relationship to metabolic control. *Journal of Pediatric Endocrinology Metabolism, 29*(6), 663–668.
82. Matsunaga, N. Y., Ribeiro, M. A., Saad, I. A., Morcillo, A. M., Ribeiro, J. D., & Toro, A. A. (2015). Evaluation of quality of life

according to asthma control and asthma severity in children and adolescents. *Journal Brasileiro Pneumologia, 41*(6), 502–508.
83. Shaji, T. D., Mohd, W. S. L., Saraswathy, K., & Arulappan, J. (2017). Parenting a child with metabolic diseases: Impact on health related quality of life of parents. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 11*(1), 25–29.
84. Santer, M., Burgess, H., Yardley, L., Ersser, S., Lewis-Jones, S., & Muller, I., et al. (2012). Experiences of carers managing childhood eczema and their views on its treatment: A qualitative study. *British Journal of General Practice, 62*(597), e261–e267.
85. Feudtner, C., Walter, J. K., Faerber, J. A., Hill, D. L., Carroll, K. W., Mollen, C. J., et al. (2015). Good-parent beliefs of parents of seriously ill children. *JAMA Pediatrics, 169*(1), 39–47.
86. Limbers, C. A., & Skipper, S. (2014). Health-related quality of life measurement in siblings of children with physical chronic illness: A systematic review. *Families, Systems & Health, 32*(4), 408–415.