

Problem-Solving Based Intervention for Informal Caregivers: A Scoping Review

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Abstract

Background: Caregiving for someone is a huge task for informal caregivers. The caregiving role is often challenging and overwhelming for them. Stress, burden, and depression have been frequently identified as the negative caregiving experiences. This systematic review synthesized the available evidence for the problem-based intervention provided for caregivers as there is little insight about the effects of problem-based intervention on caregivers. **Objectives:** To describe: 1) the design of problem-solving intervention; 2) the effects of problem-solving intervention for caregiver outcomes. **Methods:** This review followed Arksey and O'Malley's methodological framework for conducting scoping reviews which entail setting research questions, selecting relevant studies, charting the data and synthesizing the results. FPRISMA guidelines were adopted and several databases were searched including MEDLINE; EMBASE; web of science. This review contains literature from 2012 to 2019 on problem-solving-based intervention which intended to caregivers. **Results:** 41 publications representing 27 unique problem-based interventions. Problem-solving-based intervention has different extent effects on caregiver emotion status, burden and quality of life. **Conclusions:** Problem-solving intervention is promising in caregiver intervention which could reduce caregiver depression, anxiety and burden.

Keywords

Informal Caregiver, Problem-Solving, Scoping Review

1. Introduction

Caregivers play a crucial role in supporting ill, disabled or older people. However, being a caregiver is challenging and overwhelming so that many caregivers feel unprepared for their role [1]. Moreover, caregivers are usually at higher risk

for poorer physical and mental health as compared to their non-caregiving counterparts [2] [3] [4]. The global prevalence of depression and anxiety is 40.2%, 21.4% among stroke caregivers, respectively [5]. Caregivers of other conditions also have the varying extent of depressive symptoms and anxiety symptoms [4] [5] [6]. In addition, Caregivers experience substantial physical, financial, and psychosocial burden, as a result of providing help to their care recipients [7] [8].

Fortunately, there are interventions that try to alleviate the harms of caregiving outcomes. Growing evidence has demonstrated the benefit of problem-solving-based intervention [9]. Problem-solving intervention is a self-directed process that aims at identifying possible solutions for specific problems encountered in one's daily life. [10] [11]. This approach is compromised by the following steps, problem definition and formulation, generation of alternative strategies, decision making and implementation. After practicing this step, caregivers tend to employ positive coping styles and have more problem-solving abilities which contribute to positive caregiver outcomes [12].

Efforts have been made to review the effect of problem-solving intervention on patients [13], there is still a gap in reviewing problem-solving intervention targeted at caregivers. Scoping review usually aims to collect and critically analyses various research studies and look for gaps in existing literature [14]. Thus, this study aims to conduct a scoping review to identify the design of problem-solving intervention and the effects of problem-solving intervention on caregiver outcomes.

2. Methods

This study employs a scoping review following the guidance of Arksey and O'Malley's methodological framework [14]. This framework is helpful to contribute to the rigor and transparency of the scoping review methodology and helps to enhance the reliability of the findings [14]. The five steps outlined by Arksey and O'Malley's [14] framework are: 1) Identifying the research questions, 2) Identifying relevant studies, 3) Study selection, 4) Charting the data and, and 5) Collating, summarizing and reporting the results.

2.1. Framework Stage 1: Identifying the Research Question

The research questions of this scoping review were: 1) how have problem-based intervention for caregivers been developed and delivered? (e.g., design, content and delivery mechanism) 2) what's the effectiveness of problem-solving based intervention designed for caregiver with their health outcomes?

2.2. Framework Stage 2: Identifying Relevant Studies

Relevant studies were searched using EMBASE, CINAHL, Web of science from 1 January 2000 to 22 May 2019 for original articles. The literature search was conducted by searching terms of (Problem-solving therapy OR Problem solving

OR Problem-focused OR Problem-solving skills OR Problem-solving training OR Problem-solving treatment OR PST) AND (caregiver OR carer OR informal caregiver OR family caregivers).

2.3. Framework Stage 3: Study Selection

Studies were included if they met the following inclusion criteria: 1) wrote in English; 2) undertook experimental design; 3) focused on caregivers of elderly people; 4) delivered a problem-solving based intervention. Studies were excluded: 1) studies focused on caregivers to pediatric patients; 2) studies focused on paid or formal caregivers; 3) unpublished dissertations, reviews, nonexperimental studies. Two reviewers independently conducted the searching and screening.

The searching identified 1000 literature for consideration. After duplications were eliminated, there are 565 abstracts left for further identification. Finally, after the abstract and full-text screening, forty-one papers representing 27 unique interventions were included in this review. A flow chart of the research search is displayed in **Figure 1**.

2.4. Framework Stage 4: Charting the Data

The key information relating to the intervention were systematically extracted the following information for each study: author; year of publication; country; study design; caregiver population characteristics (mean age, health professional occupation, hours of caregiving for informal caregivers, diagnoses for which the patient is receiving care); sample size; intervention and control (when applicable) characteristics (material covered and hours of instruction); and outcome measures (physiological and non-physiological).

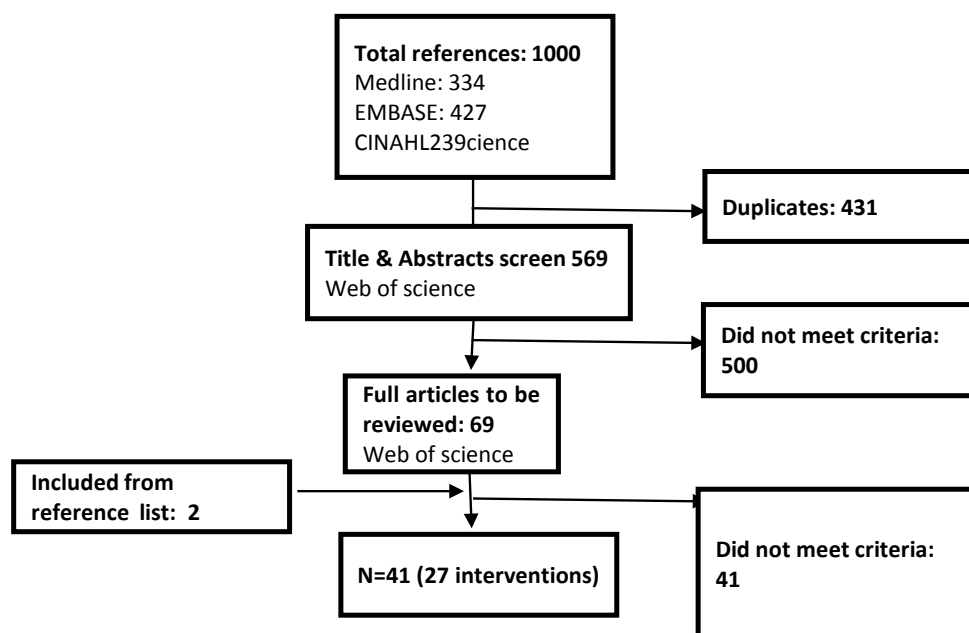


Figure 1. Flow chart of the search strategy.

2.5. Framework Stage 5: Collating, Summarizing and Reporting the Results

This review employed a narrative synthesis of the included interventions to answer the research questions. Analysis of the studies was developed inductively, focusing on how THE problem-solving intervention on caregivers' outcomes. This data analysis was taken through an interactive process of combining, categorizing, summarizing and comparing information across studies. The summative findings are in accordance with the study questions. This study did not conduct a quality assessment or limit inclusion of studies based on their methodological rigor because including a wide range of literature are best-suited to get a more complete overview of the literature.

3. Results

3.1. Results of the Search

Problem-solving interventions which delivered to caregivers of any adult in need of care were screened in this review. Of the 27 interventions representing 41 articles, 24 employed randomized control design, two of them involved randomizing in blocks [15] [16]. Other interventions incorporated one group of before-after design [17], matched cohort design [18]-[22]. Samples used in the 27 interventions ranged from 6 [17] to 514 [23]. The selected studies included interventions targeting mainly on caregivers of people with dementia, stroke, traumatic brain injury, cancer and mental illness. Most of the interventions were delivered in USA, while the rest of interventions took place in Canada, Australia, Hongkong, and Iran.

These interventions target at caregivers of many kinds of condition, including caregivers of cancer (N = 4/4), dementia (N = 4/4), mental illness (4/5), traumatic brain injury (M = 4/4) and others. Details of the intervention group are shown in **Table 1**. Most of the interventions a combination of face to face and telephone, while others used face to face, telephone, web alone. Few interventions delivered in group. Numbers of sessions ranged from 3 [23] [24] [25] to 12 [23] [24] [25]. Details about the intervention design are provided in **Table 2**.

3.2. Problem Solving Intervention Effects on Caregiver Outcomes

In accordance with the guideline of scoping review, this article did not appraise these interventions for methodological rigor. Therefore, the quality of studies is not available. The results displayed are a synthesis of what has been reported in preview studies. Nine kinds of results were reported

3.2.1. Caregiver Mood Status

Mood status for caregivers often reported with depression incidence, depression level, anxiety. Most problem-solving based intervention delivered to caregivers resulted in reduced depression level and anxiety level [16] [21] [23]-[32]. One RCT revealed that delayed incidence of depression [30].

Table 1. Study outcome measurements.

No. Intervention/ No. Study	Outcome	Study	Positive results
16/27	Mood	[37] problem-solving [23] [24] [25] [42] [43] problem-solving [17] problem-solving [24] [28] [46] problem-solving orientation [36] problem-solving [47] problem solving [22] [48] problem solving [49]-[53] problem-solving ability [56] problem solving [39] coping [18] coping	[37] improved problem solving [17] improved problem solving [24] [28] [46] less negative problem orientation [47] improved problem solving [56] better problem-solving
11/16	Burden	[37] Cancer-related distress [35] subjective and objective burden [23] [24] [25] caregiver reaction [26] burden [13] [43] burden [30] [32] distress, burden [18] perceived stress, burden [33] burden [15] distress [36] burden [47] distress	[37] reduced distress [35] reduced burden; Remained low level distress [26] lower burden [42] reduced burden [30] [32] lower level of distress and burden [33] reduced burden [15] decreased distress [36] reduced burden
10/16	QOL	[37] qol [22] [25] QOL [38] QOL [40] QOL [26] QOL [19] [20] [21] fatigue, sleep quality [33] qol [15] QOL [49]-[53] health complaints	[23] enhanced QOL [19] [20] [21] reduced fatigue [33] enhanced qol
10/20	Problem solving	[17] [24] [28] [37] [46] [47] [56] problem-solving	[37] improved problem solving [17] improved problem solving [24] [28] [46] less negative problem orientation [47] improved problem solving [56] better problem-solving
6/8	Sense of competence/ self-mastery/efficacy/ preparation	[16] sense of competence (protocol) [18] self-mastery, competency [31] sense of competence [19] [20] [21] self-efficacy [48] caregiver preparedness [56] preparation	[18] improved mastery, competence [19] [20] [21] improvement in self-efficacy [56] more prepared to caregiving role
4/7	Life satisfaction	[49]-[53] life satisfaction [54] life satisfaction [55]	[49]-[55]
3/6	Mutuality/family function	[37] quality of relationship [19] [20] [21] mutuality, [22] [48] family function	[37] improvement in relationship
2/2	Knowledge and skill	[40] knowledge and skill acquisition [41] medication management	[41] reduced medication deficiencies
2/2	Coping	[39] coping [18] coping	[39] Increased higher task-oriented coping/emotion-oriented coping [18] improved task-oriented coping
1/1	Personal control	[36] personal control	[36] increased personal control

3.2.2. Caregiver Burden

Although lack of consensus amongst studies on how problem-solving intervention affected caregiver burden, there are still significant results in caregiver burden after completion of intervention [15] [26] [30] [32]-[37]. Reductions in subjective and objective burden were observed in one study of dementia caregivers [35].

3.2.3. Quality of Life

Of all the interventions measuring quality of life, two interventions of 3 articles indicated that caregivers gained enhanced quality of life benefiting from the intervention [23] [33]. A problem-solving education intervention for caregivers of people received found better health outcomes, fatigue [19] [20] [21].

Table 2. Summary of articles included in the study.

Author/ year/study location	Method (RCT/ controlled/ uncontrolled)	Aim	Characteristic of caregiver & Care recipient	Intervention Typology (group/ individual)	Program length, number, duration	Outcome and instrument	Significant result
1 [37] USA	RCT	To test The efficacy of PST for spouses of men with prostate cancer.	Spouse of caregivers of men with prostate cancer N = 164 IG = 78 CG = 86	Individual face-to-face	• Six to eight sessions • Delivered by trained staff	Timing: • Preintervention • Post-intervention • 3-month post intervention follow-up Outcome measurement: • Problem-solving • Cancer-related distress • Mood states • Quality of life • Quality of romantic relationships	• Constructive problem-solving improved more for intervention. • Greater decrease in cancer-related distress for intervention. • Greater improvement in dyadic relationship for intervention.
2 [35] USA	RCT	To examine whether problem- solving therapy (PST) would reduce burden levels of caregivers	Caregivers of individuals diagnosed with mild cognitive impairment (MCI) or early-stage dementia (AD) N = 73 Intervention: 36 Control: 37	Individual Face-to-face and telephone contact	Nine-sessions with two phases.	Timing: • Preintervention • One-month post-intervention • 3-months post intervention • 6-month post intervention • 12month post intervention Outcome measurement: • Subjective and objective caregiver burden	• Caregivers reduced burden levels in IG. • Distress for caregivers in IG remained low over time.
3/1 [29] Spain	RCT	To evaluate the 8-year effect of indicated Prevention of depression in female caregivers.	Non-professiona l female caregivers with subclinical depressive symptoms N = 173 IG = 89 CG:84	Four-six participants in one group Face-to-face	Five weekly group sessions	Timing: • Preintervention • One-month post-intervention • 1-months post intervention • 3-month post intervention • 6-month post intervention • 1-year follow-up Outcome measurement: • Depression status • Depressive symptom severity	• Lower depressive symptom severity for caregivers in IG.

Continued

3/2	[30] Spain	RCT	To evaluate the long-term efficacy of a brief intervention for the prevention of depression in a sample of female caregivers.	Female caregivers without recent major depression episode or depression history N = 173 IG = 58 CG = 58	Group format with 5 participants each group Face-to-face	<ul style="list-style-type: none"> • 5 sessions • Session duration: 1.5 h • Session interval: one week • Intervention duration: 5 weeks 	<p>Timing:</p> <ul style="list-style-type: none"> • Preintervention • Post-intervention • 1, 3, 6, 12 months follow-up 	<ul style="list-style-type: none"> • At the 12-month follow-up, a lower incidence of depression was found in IG. • Significant delay in the onset of depression in IG. • Good complier caregivers had a lower incidence of depression • Intervention effect on depressive symptoms, emotional distress and caregiver burden were maintained for 12 months • At post-treatment, depression symptoms in IG had remitted significantly more than in CG, with a large effect size. • IG exhibited a significantly greater reduction in emotional distress and caregiver burden than CG.
3/3	[32]	As above	As above	As above	As above	As above	As above	
4/1	[23]	RCT	To assess the impact of a problem-solving intervention on caregiver quality of life and anxiety, To compare its effectiveness delivered face to face and via videoconferencing.	Hospice family caregivers N = 514 IG (face-to-face) = 171 IG (videoconferencing) = 171 CG = 172	Face to face or videoconferencing Individual Blinding	3 weekly sessions Duration: 21 days Session duration: 45min	<p>Timing:</p> <ul style="list-style-type: none"> • Preintervention • Day 15 • Day 30 • Day 60 <p>Outcome measurement:</p> <ul style="list-style-type: none"> • Quality of life • Anxiety • Problem-solving • Caregiver reaction (positive and negative reaction) 	<ul style="list-style-type: none"> • Reduced anxiety and improved quality of life in IG (face-to-face) compared with CG • Videoconferencing mediated intervention was not as effective as the F2F group
4/2	[25]	As above	To compare the effectiveness of a PST intervention delivered face-to-face with one delivered via videophone to hospice primary caregivers.	N = 126 IG (face-to-face) = 77 IG (videophone) = 49	As above	As above	As above	<ul style="list-style-type: none"> • PST delivered via video was not inferior to face-to-face delivery. • Caregiver quality of life improved and state anxiety decreased under both conditions.

Continued

4/3	[24]	As above	As above	As above	As above	As above	As above	As above
5	[38] USA	Feasibility study with RCT design	To examine the feasibility of problem-solving therapy for family caregivers of cancer patients receiving outpatient palliative care To investigate the impact of problem-solving therapy on family caregivers' anxiety, depression, and quality of life	Caregivers of cancer patients receiving outpatient palliative care N = 83 IG = CG =	Individual Videoconferencing or telephone	3 sessions Duration: 18days Session duration: 45min	Outcome measurement: • Anxiety • QOL • Depression	• Caregiver in IG reported less anxiety
6	[39] Iran	RCT Two-group	To determine the effectiveness of a theory-of-planned-behavior -based problem-solving training program on the coping styles of family caregivers of psychiatric inpatients.	Family caregivers of psychiatric inpatients. N = 72 IG = 36 CG = 36	Face-to-face group	8 sessions Duration: 4 weeks Session duration:	Timing: • Preintervention • Postintervention immediately • I-month follow-up Outcome measurement: • Coping styles	• Immediately after the intervention, IG earned significantly higher task-oriented coping style scores than CG. • At 1-month follow-up, IG earned significantly higher scores than the control group for task-oriented) and emotion-oriented coping styles.
7	[16] Germany	Cluster RCT protocol	To train care counsellors of statutory long-term care insurances in problem-solving And to evaluate this approach as an additional component in the statutory care counselling in Germany.	Distressed Informal caregiver 38 sites 58 care counsellors	Face-to-face and telephone	One session and at least one telephone contact	Timing: • Preintervention Outcome measurement: • Depression • Sense of competence	• Not applicable

Continued

8	[40] USA	RCT Assessor blinded	To determine whether a telephone-based, individualized education and mentored problem-solving intervention would improve outcomes for caregivers of persons with traumatic brain injury	Caregivers of persons with traumatic brain injury N = 153 IG = 77 CG = 76	Telephone Individual	Maximum 10 calls 2-week intervals	<p>Timing:</p> <ul style="list-style-type: none"> • Preintervention • 6-months post first assessment <p>Outcome measurement:</p> <ul style="list-style-type: none"> • QOL • Social significance • Caregiver knowledge and skill acquisition 	<ul style="list-style-type: none"> • Caregivers in IG have greater social problem-solving abilities than CG.
9	[41] USA	RCT	To examine a tailored, problem-solving intervention designed to maximize medication management practices among care-givers of persons with memory loss.	Caregivers of community-dwelling persons with memory loss (Dementia) N = 83 IG = 42 CG = 41	Face-to-face & telephone Individual	<ul style="list-style-type: none"> • 2 or 3 home visits, 2 weeks apart, • Followed by 2 - 3 telephone sessions, 7 - 10 days apart. 	<p>Timing:</p> <ul style="list-style-type: none"> • Preintervention • 2-month postintervention <p>Outcome measurement:</p> <ul style="list-style-type: none"> • Medication management 	<ul style="list-style-type: none"> • Reduced medication deficiencies in both groups
10	[26] USA	RCT Assessor blinded	To determine the effect of early versus delayed initiation of a palliative care intervention for family caregivers (cgs) of patients with advanced cancer	Family caregivers of persons with advanced cancer N = 122 IG-early = 61 IG-delayed = 61	Telephone Individual	<ul style="list-style-type: none"> • ENABLE intervention • Session duration; 23 minutes on average • Duration: 3 months • 3 weekly couch sessions & monthly phone call 	<p>Timing:</p> <ul style="list-style-type: none"> • Preintervention • Every 6 weeks until week 24 • Every 3 months thereafter until the patient participant's death or study completion. <p>Outcome measurement:</p> <ul style="list-style-type: none"> • QOL • Depressed mood • Caregiver burden 	<ul style="list-style-type: none"> • Early-group cgshad lower depression scores at 3 months and lower depression and stress burden in the terminal decline analysis
11/1	[42] Hong Kong	RCT Assessor blinded	To test the effects of guided problem-solving-based manual-guided self-learning programme for family caregivers compared with those in usual family support service.	Family caregivers of recent-onset psychosis N = 116 IG = 58 CG = 58	Face-to-face & telephone	<ul style="list-style-type: none"> • IG • Intervention duration: 5 months • Sessions: 5 assisted sessions and 5 self-learned modules • Session duration: 1.5 - 2 hours 	<p>Timing:</p> <ul style="list-style-type: none"> • Preintervention • One-week post-intervention • 6-month post-intervention <p>Caregiver Outcome measurement:</p> <ul style="list-style-type: none"> • Caregiver burden • Caregiving experience • Problem-solving ability 	<ul style="list-style-type: none"> • Post-intervention, IG provide medium-term benefits to caregiver burden, caregiving experience and patients' psychotic symptoms

Continued

11/2	[43]	As above	As above	As above	As above	As above	As above	<p>Timing:</p> <ul style="list-style-type: none"> • Preintervention • One-week post-intervention • 6-month post-intervention 	<ul style="list-style-type: none"> • Intervention significantly improved family burden and caregiving experience, and reductions in severity of psychotic symptoms and duration of re-hospitalizations than CG at 6- and 12-month follow-up
12	[18] Canada	Matched, cohort study Assessor blinded	To evaluate the effectiveness of problem-solving techniques-based intervention based in enhancing carers' physical and emotional capacity to care for relatives with dementia	Informal carers of patients with dementia receiving in-home care N = 56 IG = 28 CG = 28	Individual Face-to-face	<ul style="list-style-type: none"> • IG • 3 sessions • Session duration: 1 h • Session interval: 1 week • Intervention duration: 3 - 4 weeks 	<p>Timing:</p> <ul style="list-style-type: none"> • Preintervention • Post-intervention <p>Caregiver Outcome measurement:</p> <ul style="list-style-type: none"> • Coping styles • Self-mastery • Caregiving competency • Perceived stress • Caregiver burden 	<ul style="list-style-type: none"> • Carers in IG showed significantly improved task-oriented coping, mastery, and competence and significantly reduced emotion-oriented coping, burden and stress. 	
13	[44] USA	RCT 2 groups	To examine the efficacy of Counselor-Assisted Problem Solving (CAPS) in improving caregiver adaptation following traumatic brain injury	Caregivers of TBI N = 132 IG = 65 CG = 67	Individual 1 st session using face-to-face and the rest ones based on the internet	<ul style="list-style-type: none"> • IG • 7 sessions • 6-month period • Weekly sessions for the first 2 - 3 weeks and then biweekly sessions until the family completed the initial seven core sessions 	<p>Timing:</p> <ul style="list-style-type: none"> • Preintervention • Post-intervention • 6-month post baseline assessment <p>Caregiver Outcome measurement:</p> <ul style="list-style-type: none"> • Distress and depression • Efficacy 	<ul style="list-style-type: none"> • Greater improvements in depression in IG • No difference on global distress between two groups • Among non-frequent computer users, caregivers in IG reported significantly higher levels of caregiver efficacy than CG 	
14/1	[31] Germany	RCT	To examine the effectiveness of a problem-solving intervention (PSI) for stroke caregivers	Stroke caregivers who provided care for at least 6 months and who experienced significant strain in their role N = 122 IG = 60 CG = 62	Telephone and face-to-face Individual	<ul style="list-style-type: none"> • IG • Part 1: 5home visit + 4 telephone • Part 2: 1 home visit + 12 telephone • Delivered over a 3-month intensive intervention and a 9-month maintenance period 	<p>Timing:</p> <ul style="list-style-type: none"> • Preintervention (T0) • Post-intervention (T1, 3 months) • Post maintenance period (T2; 12 months) <p>Caregiver Outcome measurement:</p> <ul style="list-style-type: none"> • Depression • Caregiver mastery • Problem-solving ability • Physical complaints • Satisfaction with leisure time 	<ul style="list-style-type: none"> • IG showed significantly lower levels of depressive symptoms after 3 months and after 12 months 	

Continued

14/2	[45]	As above	As above	As above	As above	As above	As above	As above
15	[17] USA	Pilot study	To adapt Problem-Solving Skills Training, to the population of caregivers of youth with chronic pain Tested in a small group of parents to evaluate feasibility	Parent Caregivers of Youth with Chronic Pain 6 mothers of youth	Individual Face-to-face	<ul style="list-style-type: none"> 6-8 sessions 1 hour each For 8 weeks 	<p>Timing:</p> <ul style="list-style-type: none"> Preintervention Post-intervention <p>Caregiver Outcome measurement:</p> <ul style="list-style-type: none"> Depression Mood disturbance Pain catastrophizing Parenting stress Miscarried helping Problem-solving skills Impact of chronic pain 	<ul style="list-style-type: none"> Parental problem-solving skills improved Parenting stress decreased Depressive symptoms decreased Mood disturbance declined Parent-reported miscarried helping decreased Parents' catastrophic thinking about their child's pain declined Parents' maladaptive behavioral responses to their child's pain also declined
16	[46] USA	RCT	To evaluate the mental health effects of problem-solving therapy (PST) for caregivers	Caregivers of individuals with a recent diagnosis of Mild Cognitive Impairment (MCI) or early dementia. N = 73 IG = CG =	Face-to-face Reinforce by telephone Individual	<ul style="list-style-type: none"> Phase 1: six sessions conducted in the caregiver's home approximately 2 weeks apart, each lasting approximately 1.5 hours. Phase 2: three telephone contacts (approximately 2 weeks apart), each lasting approximately 45 minutes. 	<p>Timing:</p> <ul style="list-style-type: none"> Preintervention 1, 3, 6, 12 months Post-intervention <p>Caregiver Outcome measurement:</p> <ul style="list-style-type: none"> Depression Anxiety Problem-solving orientation 	<ul style="list-style-type: none"> IG led to significantly reduced depression symptoms, particularly among early dementia caregivers. IG lowered caregivers' anxiety levels, and led to lessening of negative problem orientation.
17/1	[28] Spain	Mixed-study Experimental study with randomized control	To evaluate the effectiveness of the problem-solving technique in reducing symptoms of anxiety and depression among primary caregivers	Female primary caregivers of the chronically ill patients, N = 122 IG = 61 CG = 61	Face-to-face home visit Individual	<ul style="list-style-type: none"> 4 sessions 	<p>Timing:</p> <ul style="list-style-type: none"> Preintervention 1-month post intervention <p>Caregiver Outcome measurement:</p> <ul style="list-style-type: none"> Depression Anxiety Problem-solving orientation 	<ul style="list-style-type: none"> Caregivers in IG reduced symptoms of anxiety and depression in family caregivers of the chronically ill patients
17/2	[27]	As above	As above	As above	As above	As above	As above	As above

Continued

18/1	[20] [21] USA	Longitudinal repeated measures with one group	To determine the effect of problem-solving education on self-efficacy and distress in caregivers	Informal caregivers of allogeneic hematopoietic stem cell transplantation patients N = 71	Face to face or conference call	• Three 1-hour sessions	<p>Timing:</p> <ul style="list-style-type: none"> • Pre-hematopoietic stem cell transplantation • Preintervention after discharge • 6 weeks after discharge <p>Caregiver Outcome measurement:</p> <ul style="list-style-type: none"> • Self-efficacy • Healthy behaviors • Sleep quality • Fatigue • Mutuality 	<ul style="list-style-type: none"> • Active caregivers reported improvements in self-efficacy and distress post problem-solving education; • Caregiver responders also reported better health outcomes such as fatigue.
18/2	[19]	As above	As above	As above	As above	As above	As above	As above
18/3	[20]	As above	As above	As above	As above	As above	As above	As above
19	[33] Iran	RCT	To determine the effect of a supportive educational program, based on COPE model, on individuals, on the caring burden and quality of life in the family caregivers of women with breast cancer.	Family caregivers of women with breast cancer. N = 64 IG = 32 CG = 32	Telephone & face-to-face	<ul style="list-style-type: none"> • Two hospital visits and two telephone sessions based on COPE model for 9 days 	<p>Timing:</p> <ul style="list-style-type: none"> • Preintervention • One-month post-intervention <p>Caregiver Outcome measurement:</p> <ul style="list-style-type: none"> • Quality of life • Caregiver burden 	<ul style="list-style-type: none"> • Physical, mental, spiritual, environmental domains and overall quality of life in the family caregivers were significantly increased in IG. • Significant decreased caregiver burden in IG compared with CG.
20	[15] Australia	RCT with randomization in blocks of 10 Assessor blinded	To examine whether completion of a self-directed problem-solving bibliotherapy among carers of young people with FEP led to a better experience of caring, less distress and expressed emotion, and better general health than carers who only received treatment as usual	<ul style="list-style-type: none"> • Carers of young people with first-episode psychosis • N = 124 • IG = 61 • CG = 63 	Self-help	5 weeks with 2h each module 10-min telephone call each week from a researcher to determine whether the module had been completed.	<p>Timing</p> <ul style="list-style-type: none"> • Preintervention • 6 weeks follow-up • 16 weeks follow-up <p>Caregiver outcome measurement</p> <ul style="list-style-type: none"> • Caregiver experience • Distress • Expressed emotion • QOL 	<ul style="list-style-type: none"> • Caregivers in IG experienced a greater reduction in negative emotional evaluations of the need to provide help than CG by week 6. • Caregivers in IG experience a greater decrease in distress from baseline to 6 weeks

Continued

21	[36] USA	RCT Transactional theory of stress and coping Assessor blinded	Determinize Feasibility, acceptability, and effect size estimates for depression, burden, personal control, And PSS.	Caregivers of children with mental health problems N = 61 IG = 30 CG = 31	Combination of face to face and telephone Individual	<ul style="list-style-type: none"> • One 1-hour face to face session and eight weekly telephone sessions 	<p>Timing</p> <ul style="list-style-type: none"> • Baseline • Post-intervention • 3,6 months post-intervention <p>Caregiver outcome measurement</p> <ul style="list-style-type: none"> • Personal control • Problem-solving • Depressive symptoms • Burden 	<ul style="list-style-type: none"> • Reduced burden and increased personal control 3-months post-intervention in IG for caregivers with or without depression
22	[47] USA	RCT	To examine the results of Teen Online Problem Solving (TOPS) , in increasing problem-solving skills and decreasing depressive symptoms and global distress for caregivers	<ul style="list-style-type: none"> • Caregivers of adolescents with traumatic brain injury <p>N = 40 IG = 20 CG = 21</p>	Web Face-to-face Individual	<ul style="list-style-type: none"> • One home visit and 9 - 13 web-based sessions • Each session: 45 - 60 min 	<p>Timing</p> <ul style="list-style-type: none"> • Baseline • Follow-up assessment (7.83 m following baseline) <p>Caregiver outcome measurement</p> <ul style="list-style-type: none"> • Problem-solving • Parental distress • Depression 	<ul style="list-style-type: none"> • Improvements in problem-solving skills and depression were moderated by family income, with caregivers of lower income in IG reporting greater improvements • Increases in problem-solving partially mediated reductions in global distress.
23/1	[48] USA	RCT Stress and coping model Assessor blinded	To assess the efficacy of a caregiver problem-solving intervention (CPSI) on stroke caregiver physical and psychosocial adaptation compared with a wait-list control (WLC) treatment, And to assess the mediation effects of coping on outcomes.	Caregivers of stroke N(baseline) = 255 IG = 136 CG = 119	Combination of face to face and telephone Individual	<ul style="list-style-type: none"> • IG • 10 sessions 	<p>Timing</p> <ul style="list-style-type: none"> • Baseline • Postintervention • 6,12 months postdischarge <p>Caregiver outcome measurement</p> <ul style="list-style-type: none"> • Outcome • Depression • Caregiver preparedness • Anxiety • Family functioning <p>Moderator and mediator</p> <ul style="list-style-type: none"> • Perceived health • Resources and stressors • Appraisal • Problem solving 	<ul style="list-style-type: none"> • Improved depression, life change, and health favoring IG postintervention • Difference in depression rate of change favoring IG • Perceived health, threat appraisal and rational problem-solving were significant mediators for outcomes
23/2	[22]	Pilot study	As above	As above	As above	As above	As above	As above

Continued

24/1	[49] USA	RCT	<ul style="list-style-type: none"> To examine whether an individualized problem-solving intervention provided to family caregivers provide benefits to both caregivers and their care recipients. Caregiver of persons with severe disabilities <ul style="list-style-type: none"> N = 147 IG = 74 CG = 73 	Combination of face to face and telephone Individual	<ul style="list-style-type: none"> IG 4 home visits (at months 1, 4, 8, 12) and 8 monthly telephone sessions Intervention duration: 12 months 	<p>Timing</p> <ul style="list-style-type: none"> Baseline preintervention 4, 8, and 12 months of participation <p>Caregiver outcome measurement</p> <ul style="list-style-type: none"> Problem-solving Depression Satisfaction with life Health complaints Caregiver burden 	<ul style="list-style-type: none"> Caregivers in IG reported significant decrease in depression over time Caregivers in IG displayed gains in constructive problem-solving abilities and decreases in dysfunctional problem-solving. 	
24/2	[50] USA	RCT	<ul style="list-style-type: none"> To examine the effectiveness of an individualized problem-solving intervention provided to family caregivers of women living with severe disabilities. Family caregivers of women with disabilities <ul style="list-style-type: none"> N = 81 IG = 38 CG = 43 		<ul style="list-style-type: none"> 4 home visits (at months 1, 4, 8 and 12) and 8 monthly telephone calls Intervention duration: 12 months 	<p>Timing</p> <ul style="list-style-type: none"> Baseline 6, 9, 12-month assessment <p>Caregiver outcome measurement</p> <ul style="list-style-type: none"> Caregiver depression Life satisfaction Caregiver health complaints Problem-solving abilities 	<ul style="list-style-type: none"> Caregivers in IG reported a significant decrease in depression over time. Caregivers in IG displayed an increase in constructive problem-solving styles over the year. 	
24/3	[51]	As above	As above	N = 60 IG = 30 CG = 30	As above	As above	As above	As above
24/4	[52]	As above	As above	As above	As above	As above	As above	As above
24/5	[53]	As above	As above	As above	As above	As above	As above	As above
25	[54] USA	RCT	<ul style="list-style-type: none"> To test the effectiveness of an individualized problem-solving intervention delivered in Videoconferencing sessions with family caregivers of persons living with a spinal cord injury (SCI) and Possible contagion effects on care recipients. Caregivers of people living with a spinal cord injury <ul style="list-style-type: none"> N = 61 IG = 30 CG = 30 	Videoconfer- ence	<ul style="list-style-type: none"> 1 face to face teaching how to use videophone 12 monthly videoconfe- rencing sessions 	<p>Timing</p> <ul style="list-style-type: none"> Baseline 6, 12-month assessment <p>Caregiver outcome measurement</p> <ul style="list-style-type: none"> Caregiver depression Life satisfaction Caregiver health complaints Problem-solving abilities 	<ul style="list-style-type: none"> Significant decrease in depression among caregivers in IG Caregivers receiving PST reported gains in social functioning over time. 	

Continued

26	[55] USA	RCT	To test the hypothesis that a problem-solving training program would lower depression, health complaints, and burden, and increase well-being for caregivers	Family Caregivers of Persons With Traumatic Brain Injuries N = 61 IG = 30 CG = 30	Combination of face to face and telephone Individual	<ul style="list-style-type: none"> • 4 home visits (at months 1, 4, 8 and 12) and 8-monthly 	<p>Timing</p> <ul style="list-style-type: none"> • Baseline • 6, 12-month assessment <p>Caregiver outcome measurement</p> <ul style="list-style-type: none"> • Caregiver depression • Caregiver depression • Health complaints • Well-being • Problem-solving 	<ul style="list-style-type: none"> • Caregivers receiving problem-solving training reported significant decreases in depression, health complaints, and in dysfunctional problem-solving styles over time.
27	[56] USA	Pilot study	To examine the outcomes and participant-reported benefits of a caregiver education programme (<i>Meeting the Challenges of MS</i>)	Caregivers of multiple sclerosis (MS) N = 19 (12 finished intervention)	Group-based Face to face	<ul style="list-style-type: none"> • 5 weekly sessions • 2-hour per session <p>5-week period</p>	<p>Timing</p> <ul style="list-style-type: none"> • Preintervention • Postintervention <p>Caregiver outcome measurement</p> <ul style="list-style-type: none"> • Problem-solving • Preparation 	<ul style="list-style-type: none"> • The participants reported more prepared for their caregiving role • Caregivers were able to reframe their experiences positively and sought more practical assistance.

Notes: IG = intervention group; CG = control group.

3.2.4. Problem Solving

Some studies view problem-solving as moderator or mediator factor, while some intervention views it as outcome variable.

4. Discussion

As far as we know, this is the first scoping review which has endeavored to synthesize studies on problem-solving based intervention for family caregivers without focusing on one single illness of caregiving recipient. Specifically, this article described the details of each intervention design, the impact on caregiver outcomes. In total, 41 references representing 27 unique problem-solving-based intervention were included. Most interventions were targeted at caregivers of cancer, traumatic brain injury, mental illness caregivers and other conditions.

The interventions aimed to improve a wide range of caregiver outcomes by providing different delivery form, intervention duration. Of all the reported outcomes, caregiver mood, burden, quality of life and problem solving were the mostly common outcomes. Findings were mixed in terms of how problem-solving interventions impacted caregiver outcomes.

Existing research has highlighted the significance of providing support to enhance caregiver adaption [57] [58]. Of the promising interventions, problem-solving is promising in obtaining positive caregiver outcomes [9]. As com-

pared to usual care or attention control, problem-solving intervention delivered no matter face-to-face, telephone, web or combined, have achieved enhancement in caregiver adaption. Evidence highlights the use of combination of face-to-face and telephone when delivering intervention [9] because this kind of delivery mode may be economic and has the advantage of building relationship with caregivers.

This review indicated inconsistent results among the intervention effects on caregiver outcomes. A meta-analysis would give greater power to analysis the potential effects pertaining to depression and perhaps even quality of care and burden. Meta-analysis to review the effects of problem-solving may also provide the opportunity for rigorous analysis of between-illness differences in caregiver outcomes. There are limitations in this scoping review, including the English language restriction and the start-date for the search that was set. Maybe there are some possible studies published in languages other than English and published prior to 2000.

This study reviewed the growing body of intervention describing the details of problem-solving intervention, effects on caregiver outcomes. Most of the problem-solving intervention delivered to caregivers of dementia, traumatic brain injury, cancer, mental illness and aimed to improve a range of health outcomes for family caregivers. Problem-solving interventions were provided based on basic steps of problem-solving. Most studies reported reduced caregiver burden, decreased depression and enhanced quality although few studies did not show significant results. This review highlights that caregiver needs to be supported and problem-solving intervention may be potential to enhance caregiver experience. Future studies are wanted to employ problem-solving intervention to support caregivers.

5. Conclusion

This study reviewed the growing body of literature regarding problem-solving intervention delivered to caregivers. Most subjects of the problem-solving interventions are dementia caregivers, cancer caregivers. The frequently reported outcomes for caregivers are mood status, caregiver burden, quality of life and coping. The review revealed that problem-solving interventions are promising for negative outcomes of caregiving, although there lacks the effect on caregiver positive outcome, like benefit, benefit of caregiving. With studies consistently evaluating problem-solving intervention, this may be an opportune time to conduct a meta-analysis or systematic review to better-evaluate the impact of problem-solving interventions on caregiver's outcome.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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