

# Behavioral Interventions for the Patient–Caregiver Unit in Patients with Chronic Heart Failure: A Systematic Review of Caregiver Outcomes

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**Background:** Chronic heart failure (CHF) is a debilitating condition that affects millions worldwide. It is accompanied by a myriad of adverse consequences, such as diminishing of quality of life and deterioration of mental health. Caregivers play a pivotal role in helping CHF patients manage their conditions and symptoms, as a result the physical, mental and emotional state of caregivers have a direct impact on CHF patients and the management of this condition.

**Purpose:** This systematic review aims to synthesize data about the effectiveness of behavioral interventions targeted at patients with chronic heart failure (CHF) and/or informal caregivers of CHF patients to improve overall management and treatment of CHF in the population.

**Patients and Methods:** Three databases were searched for published studies and studies that included evaluated outcomes of interventions that targeted CHF patients or informal caregivers. All randomized controlled trials, trials of either experimental or quasi-experimental design were included. Studies that only involved formal caregivers, patient populations of adolescents/young adults and patients with non-chronic conditions were excluded.

**Results:** Across the 21 included studies, no study reported a significant improvement in all three domains of quality of life (QoL), depression and loneliness of caregivers while only three studies reported a significant improvement in two outcomes. Within each domain, heterogeneity in measures limited quantitative pooling.

**Conclusion:** This review provides data on the efficacy of interventions targeted at CHF patients and/or informal caregivers. It also highlights successful interventions and its features. Following this, additional resources need to be invested and directed towards implementing these interventions.

**Keywords:** caregiver burden, chronic care, multidisciplinary care, psychosocial

## Introduction

Chronic heart failure (CHF) is a debilitating condition that affects close to 26 million people worldwide. There is a dramatic increase in prevalence, especially in developed countries and amongst older adults.<sup>1,2</sup> CHF usually manifests symptoms such as shortness of breath, weakness in limbs, fatigue, which worsens over time in periodic stages.<sup>3–5</sup> With the advent of technology and medical advancements, pharmacological agents and non-pharmacological agents such as the implantation of intra-cardiac defibrillators (ICD) and cardiac resynchronization therapy have markedly improved clinical outcomes of patients with CHF.<sup>6–9</sup> However, CHF remains associated with high mortality rates, high hospitalization rates and poor quality of life outcomes.<sup>1</sup>

Additionally, it has been found that increased burden on the caregivers of CHF patients adversely affects patient outcomes. Caregivers play a pivotal role in CHF disease management by helping patients cope with symptoms, providing emotional support, and aiding in decision-making.<sup>10</sup> Being a chronic debilitating condition, there can be a significant toll on informal caregivers,<sup>11</sup> increasing the incidence and severity of loneliness, depression, and poor quality of life amongst caregivers.<sup>12</sup> Such adverse

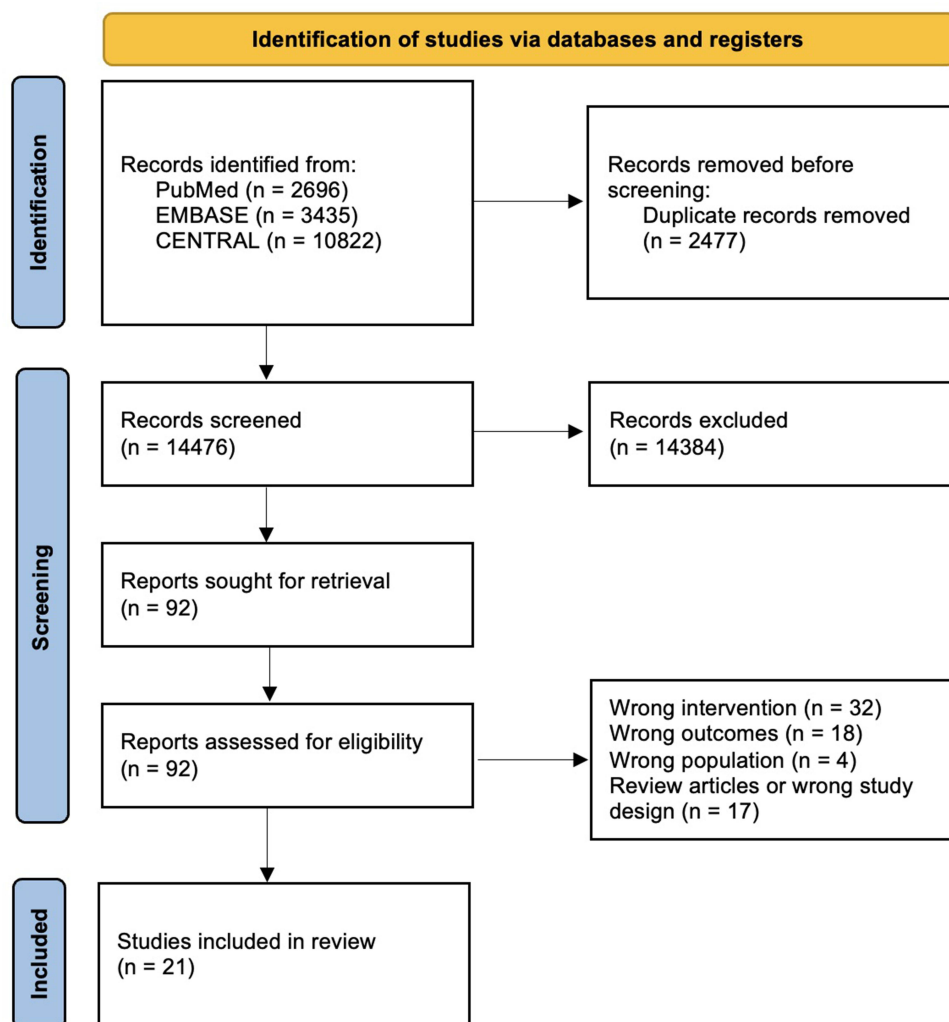
caregiver outcomes are strongly associated with poor patient outcomes such as increased mortality and hospital readmissions. Many studies have shown that behavioral interventions that target caregivers and patients alike have benefited patient–caregiver dyads. However, there is significant heterogeneity among such studies, with varying interventions and qualitative and quantitative ways of evaluating outcomes and results. Therefore, this systematic review aims to synthesize data from varying studies to identify effective interventions that could alleviate patient and caregiver outcomes, improving CHF care and management in the population.

## Methods

The systematic review was reported according to the Preferred Reporting Items of Systematic Reviews and Meta-Analyses (PRISMA) guidelines.<sup>13</sup> Searches of three databases (PubMed, Embase and CENTRAL) were conducted for studies published from the date of inception to June 2021.

## Search Strategy

Literature search was performed using search strategy for each database using the search strategy in [Supplementary Table 1](#) and other sources retrieved 16,953 results. References were imported into EndNote X9 and 2477 duplicates were identified and removed. Of 14,476 titles and abstracts screened, 14,384 were excluded. After screening the full-text studies, 21 were included in the review. The screening process is detailed in the PRISMA flowchart in [Figure 1](#).



**Figure 1** PRISMA flowchart.

**Notes:** The PRISMA figure is available from: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71. Creative Commons CC BY 4.0.<sup>40</sup>

## Study Selection

Studies evaluating outcomes of interventions that are targeted at the patient or informal caregivers were included. We included all randomized controlled trials, and trials of either experimental or quasi-experimental design according to the PICOS (population, intervention, comparison, outcomes) inclusion and exclusion criteria. We included studies that involved patients formally diagnosed with heart failure of any stage and their informal caregivers implementing any behavioral intervention, which could be educational, psychoeducational or counseling delivered through synchronous or asynchronous means.

Outcomes of interest included caregiver-related psychosocial outcomes, spanning domains including caregiver burden, stress, self-efficacy and confidence, loneliness, depression and quality of life. To be included, studies should measure and report outcomes of informal caregivers of patients. Only controlled prospective studies were included in this review.

We subsequently excluded other types of studies: studies that only involved formal caregivers, studies where the patient population consisted of adolescents/young adults or patients with non-chronic conditions, studies with small sample sizes of less than 10, and studies that did not report on any form of caregiver outcome.

Two reviewers independently screened citations and abstracts to identify studies potentially meeting the inclusion criteria. For those studies, full-text versions were retrieved and independently screened by two reviewers to determine whether they met inclusion criteria. Disagreements about whether the inclusion criteria were met were resolved through consensus with a third senior reviewer.

## Data Extraction

Data extraction of relevant study information for studies meeting inclusion criteria was performed independently by two reviewers. Disagreements were resolved through discussion.

## Quality Assessment

The Jadad score was used to assess the quality of included studies and consists of three items: randomisation (0–2 points), blinding (0–2 points) and participant dropout and withdrawal (0–1 points). The final score ranges from 0 to 5 points with higher scores indicating better quality. Studies rated to have a score of 2 or less were considered to be of low quality and those with a score of 3 or more were considered to be of high quality. [Supplementary Table 2](#) reports methodological quality of all retained studies using the Jadad scale to assess risk of bias in all trials regardless of design. Quality assessment of each included study was performed by two reviewers independently with any discrepancies resolved by consensus.

## Results

### Description of Studies

Of the 21 studies, eight were conducted in the Asia-Pacific Region, with three studies in countries with Chinese culture. Another seven studies were conducted in the United States (US), and one study was conducted in the United Kingdom (UK). All studies did not target any specific racial or ethnic group. However, one of the studies<sup>14</sup> conducted in the US unintentionally contains a less diverse sample due to their recruitment method. There was also no particular socio-economic group targeted by any of the studies.

Fourteen studies were randomized controlled trials, four were quasi-experimental, while one study was a single-arm pilot clinical trial, one was a mixed comparative study, and one was a mixed model study.

### Types of Outcomes

Across the 21 studies, three primary outcomes were identified as measures of caregiver burden, namely 1) Quality of Life (QoL), 2) Depression, Anxiety and 3) Loneliness. Twenty studies provided data on quality of life, 14 studies provided data on depression, two studies provided data on anxiety and three studies provided data on loneliness. Heterogeneity was noted in the measures of effect used for each domain across studies. However, each questionnaire used had prior validation before use in the study. [Table 1](#) provides a summary of characteristics of all included studies, while [Table 2](#) provides a summary of the outcomes and scales used in all included studies.

**Table I** Summary of Interventions

Source	Study Design	Participants	Recipient of Intervention/ Control	Intervention Group			Control Group
				Tele/In-Person	Type	Description	
Etemadifar et al <sup>24</sup>	RCT	Caregivers recruited from three selective teaching hospitals in Isfahan, Iran (n= 100)	Caregiver only	Mixed	Multimedia, telesupport, group discussion, multimedia.	Four consecutive weekly multimedia training session of 2 hours (including education and family support by a team of cardiologist physician, psychiatric nurse, a cardiac nurse and a clergyman)  Phone and personal consultation up to 3 months after the intervention in the patient and family education centre	Routine hospital care (with two multimedia training sessions, receiving an educational booklet, a CD and a website specially designed for family caregivers)
Hu XL et al <sup>25</sup>	RCT	Caregivers and patients from one hospital in Chengdu, People's Republic of China Caregivers were (1) more than 18 years old, (2) being the primary family caregiver (with the longest caregiving time amongst family members), (3) living in Chengdu, and (4) ability to understand and speak Chinese (n=118)	Caregiver only	Mixed	Text materials, Support group, Telesupport, telephone calls.	3-month multidisciplinary supportive programme (printed brochure for caregivers, three 60 min session of group classes, three 30-min peer support group sessions, regular telephone-based consultation and follow-up during the programme)	The usual care was health education about heart failure provided by nurses during the hospitalisation and at discharge. In addition, information and consultation about heart failure were available on the ward during the hospitalisation.
Lijeroos et al <sup>26</sup>	RCT	Partners to patients with heart failure were recruited from two hospitals in the southeast of Sweden (n=155)	Patient and caregiver (dyad)	In-person only	Text materials, Counselling (nurse), Multimedia.	Standard care + 3 visits to the clinic (lasting approx. 1 hour) consisting of cognitive, behavioural, and supportive components aimed at enhancing both physical and mental wellbeing + QOL through the programme.  The programme involves: nurses providing face-to-face counselling, educational booklets, computer programme	Standard care is addressed to the patient and concentrates on the patient's treatment and needs, including patient education and optimised treatment according to international guidelines.
Chiang et al <sup>15</sup>	Quasi-experimental	Patients with heart failure and their primary family caregiver were recruited as a dyad by a research nurse from the Heart Failure Center, cardiac surgical ward, or cardiac medical ward of a medical centre in northern Taiwan (n=60)	Caregiver only	Telehealth only	Telehealth, discharge planning, telesupport.	Traditional discharge planning with telehealth device provided, Telehealth care (24 hour health education counselling and medical referral services by telephone 7 days per week + patient health education + provide timely feedback on the caregiver/patient's management of heart failure)	Traditional discharge planning, whereby the case manager contacted the family caregiver to understand the patient's condition and provide health consultation 2 weeks after discharge.  The case manager also covered the physical, psychological, and social problems of families and patients; however, these issues were not continually monitored through communication with the health care team every week.

Dionne-Odom et al <sup>27</sup>	RCT	Caregivers aged 18 years and older who self-identified as an unpaid close friend or family member who knew the patient well and who was involved with their day-to-day medical care. Participants were recruited from outpatient heart failure clinics at a large academic tertiary care medical centre and a Veterans Affairs medical centre (n=158)	Caregiver only	Telehealth only	Telehealth, text materials, phone calls.	Standard care + four weekly psychosocial and problem solving telephonic sessions lasting between 20 and 60 minutes facilitated by a trained nurse coach guided by a Charting Your Course—Caregiver guidebook + monthly follow-up for 48 weeks	Standard Care (no additional information)
Nget al <sup>28</sup>	RCT	Caregivers and patients recruited from three hospitals within the Hospital Authority in Hong Kong (n=84)	Patient and Caregiver	Mixed	Telehealth, home visits, telephone calls.	Standard care + post discharge home visits and telephone calls over 12 weeks 1st month: Event happening every week Next 2 months: Maintenance intervention dose of monthly home visits supplemented by a social visit and a telephone follow-up by volunteers were provided.	Both the intervention and the control group received a pre-discharge palliative care referral consultation, and standard discharge planning including a scheduled outpatient PC clinic.  An unstructured episodic home care service could be arranged for patients upon discharge if needed. The comparison group received two social calls.
Barutcu et al <sup>20</sup>	Quasi-experimental	Caregivers aged 18 years and older; had no hearing or speaking impairment, lived with the patient, was literate in Turkish and was the primary helper with the patients' daily activities (n=69)	Caregiver only	In-person only	Peer support group	Support group meetings for caregivers once a week	Standard care (no additional data)
Srisuk et al <sup>29</sup>	RCT	Patient-carer dyads attending cardiac clinics in southern Thailand (n=100)	Patient and caregiver (dyad)	Mixed	In-person, education, telehealth, text materials, multimedia, phone calls.	6-month programme: 1 face-to-face education counselling session + heart failure manual + DVD and telephone follow-up.	The usual care group received standard medical and nursing care from the hospital, including physical and biomedical examinations at outpatient clinics and general medical advice (usually a brief discussion on current health status).  To reduce the potential of patient contact acting as a confounding variable, this group received equivalent contact with research personnel to the education group; this involved general health discussion and was not HF-specific.

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Table I (Continued).

Source	Study Design	Participants	Recipient of Intervention/ Control	Intervention Group			Control Group
				Tele/In-Person	Type	Description	
Fathani et al <sup>30</sup>	RCT	Family caregivers of CHF patients admitted to the Cardiac Care Unit of Ghaem Hospital of Mashhad, Iran in 2014 (n=120)	Patient and caregiver	In-person only	Education, text materials.	Standard care + Designated educational program was implemented in 1–4 sessions (30 minutes to one hour each). Designated educational intervention consisted of face-to-face training, relevant lectures, and question and answer. At the time of discharge, patients and family caregivers were provided with educational booklets including all the training content and were asked to apply the educational strategies at home.	Standard care (no additional details)
Borji et al <sup>21</sup>	Semi-experimental	Caregivers were the family members of patients with HF hospitalised in two parts (CCU 1, CCU 2) in Shahid Mostafa Hospital in Ilam city in Iran (n=71)	Caregiver only	In-person only	Education	Spiritual intervention over six 45-minute sessions during a period of 2 weeks (14 days; three times a week; every other day). Spiritual care included topics such as trust, patience, friendship, forgiveness, recitation, and praying	Standard care (no additional details)
Bakitas et al <sup>31</sup>	Pilot clinical (single arm)	Study participants were recruited from cardiology clinics at 1) Dartmouth-Hitchcock Medical Centre (DHMC), Lebanon, NH, which serves a largely rural, white population in a state ranked lowest in religiosity, and 2) the University of Alabama at Birmingham (UAB), Birmingham, AL, which serves a diverse rural-urban population that includes a large proportion of Blacks/African-Americans in a state ranked highest in religiosity Patient inclusion criteria: 1) diagnosis of NYH Class III/IV and/or AHA Stage C/D HF; 2) English speaking; 3) ≥50 years of age; and 4) completion of baseline questionnaires. Caregivers were only excluded for non-correctable hearing loss (n= 61 patients, 48 caregivers)	Patient and caregiver	Mixed	In-person, education, telehealth, phone calls.	EPC intervention comprised 1) an in-person outpatient palliative care consultation; and 2) weekly, semi-structured palliative care nurse coach (patients: 6 sessions; caregivers: 4 sessions) telephone and monthly follow-up sessions using Charting Your Course, an educational guidebook.	No Control Group.

Lang et al <sup>19</sup>	RCT	Caregivers and patients recruited from a single centre in Tayside, Scotland (n=50 patients, 21 caregivers)	Patient and caregiver	Mixed	Text materials, multimedia, phone calls.	REACH-HF intervention plus usual care It comprises the 'Heart Failure Manual' (REACH-HF manual), relaxation compact disc (CD), chair-based exercise digital versatile disc (DVD), a 'Progress Tracker' tool for patients and a 'Family and Friends Resource' for caregivers. Participating patients and caregivers worked through the REACH-HF manual over a 12-week period with facilitation by two trained cardiac nurses. The facilitators provided support as needed of which at least one was face to face and two were by telephone contacts	Standard care (no additional details)
Piette et al <sup>16</sup>	RCT	HF patients and caregivers were recruited from VA outpatient clinics (n=379)	Patient and caregiver	Telehealth only	IVR calls	Mobile health + CarePartner™ (mHealth+CP): Patients received identical services, plus email summaries and suggestions for self-care assistance automatically sent to their CarePartners.	Standard mHealth received: weekly automated self-care support calls for 12 months with notifications about problems sent to clinicians.
Gary et al <sup>32</sup>	RCT	FCGs of persons with HF aged 21 years or older, fluent in English, ambulatory, and physically able to engage in structured, low-impact walking, and upper body strength training program and sedentary (n=127)	Caregiver only (FGC - family caregiver)	Mixed	Group sessions, phone calls	Four consecutive weekly group sessions consisting of usual care plus the psychoeducational intervention. The goals of the psychoeducational sessions were to provide FCGs with the recommended self-care management guidelines. In addition, the FCGs focused on communication and strategies that provided motivation, social support, coping skills, and accessing resources. Telephone calls occurred weekly for 12 weeks and then bimonthly during the remaining 12-week maintenance period.	Usual Care attention control (UCAC) group received the usual care provided to FCGs such as standardised information on HF care. Participants in the UCAC group participated in one group session on nutrition education and returned demonstration of the stretching and flexibility movements. They received a printed manual and DVD that included all the stretch and flex movements designed by the study team. The stretching and flexibility protocol had previously been piloted in persons with HF and was effective for engaging participants as a placebo condition but not strong enough to influence physical function outcomes.
				Mixed	Group sessions, phone calls, and exercise (as placebo)	In addition, participants performed the combined aerobic and resistance exercise program for 12 weeks followed by a 12-week maintenance period. Progressive low-to-moderate-intensity walking was used for the aerobic exercise component. Colour-coded Thera-cords (Hygenic Corp, Akron, OH) were used for the resistance exercise component.	

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Table 1 (Continued).

Source	Study Design	Participants	Recipient of Intervention/ Control	Intervention Group			Control Group
				Tele/In-Person	Type	Description	
Sebern et al <sup>22</sup>	Quasi-experimental (one group)	Eleven care partner dyads with a patient diagnosis of HF were recruited from a Midwestern home health care agency (n=9 dyads + 1 caregiver)	Patient and caregiving partner (dyad)	In-person only		Shared Care Dyadic Intervention (SCDI). The SCDI is a structured, one-on-one dyadic intervention for care partners managing HF.	No control group
Ågren et al <sup>33</sup>	RCT	Patient- Caregiver dyads recruited from the emergency department and department of Cardiology at a university hospital in Sweden. (n= 155 patient-caregiver dyads)	Patient and caregiver (dyad)	Mixed	In-person, multimedia, text materials.	Psychoeducation intervention delivered in 3 modules through nurse-led face-to-face counselling, computer-based education, and other written teaching materials to assist dyads to develop problem-solving skills.	Traditional care in hospital and outpatient education and support: mainly focused on the patient's needs.
Ågren et al <sup>23</sup>	Pilot RCT	Partners of patients with PHF at a university hospital in south-east Sweden were recruited (n=42)	Patient and partner	Mixed	In-person, phone calls	Psycho-educational intervention in addition to standard care psycho-educational support at 2–4 weeks after discharge, from a multidisciplinary team consisting of a physician, a nurse, and a physiotherapist.	Patients and their partners routinely received standard care by members of a cardiac surgery care team. The patients received information from the thoracic surgeon, thoracic anaesthetist and a nurse during hospital admission before surgery. One week after discharge, the same nurse contacted the patients for a follow-up call. Patients then received non-structured information about recovery, medication, rehabilitation, and follow-up procedures.
Lofvenmark et al <sup>34</sup>	RCT	Caregivers and patients recruited from a hospital in Stockholm area (n=128)	Patient and caregiver			Group-based multi-professional education programme	Information about CHF and self-care was given according to the regular routines of the hospital. The information was usually provided by a nurse or a physician. Information about CHF was available by a poster and brochures on the ward. Family members could receive information both in oral and written material.



McMillan et al <sup>17</sup>	Two group mixed methods comparative experimental design	Caregivers and patients recruited from Lifepath Hospice, Florida (n=60)	Patient and caregiver	Mixed	Text materials, telesupport, phone calls.	Usual care + COPE intervention First, written information that is organised to facilitate problem-solving is presented in the Home Care Guide for Advanced Heart Disease 26, a reference for caregivers that was developed based on the original by Bucher et al and given to each caregiver at the first intervention visit. Patient problems are described with suggestions for management included in this book developed for easy reference by caregivers. Second, the RA-intervention nurse reviewed the use of HF COPE problem solving principles in caring for someone with advanced heart disease. Third, two calls from the intervention nurse were made after each of the intervention visits. During these calls, the intervention, nurses 1) asked about current problems regarding the targeted symptoms, 2) offered support in solving the problems, and 3) answered questions as needed.	Standard care (no additional details)
Wingham et al <sup>18</sup>	RCT	Caregivers and patients recruited from primary and secondary care settings in four centres in the United Kingdom (Birmingham, Cornwall, Gwent and York) (n=97)	Patient and caregiver	Mixed	Text materials, home visit, telehealth, phone calls.	Rehabilitation EnAblement in Chronic Heart Failure (REACH-HF), comprising: - 'REACH-HF manual' - 'Progress tracker' - 'Family and friends resource' delivered at the patient's home via a mixture of face-to-face and telephone contacts over 12 weeks (typically 4–6 contacts)	Standard care (no additional details)

(Continued)

Table I (Continued).

Source	Study Design	Participants	Recipient of Intervention/ Control	Intervention Group			Control Group
				Tele/In-Person	Type	Description	
Piamjariyakul et al <sup>14</sup>	Mixed method, random assignment	Patients and caregivers were recruited from an outpatient cardiology HF follow-up clinic in a Midwestern medical center (n=20)	Patient and caregiver	Telehealth only	Telehealth, text materials, phone calls.	<p>FamHFCare includes 4 weeks of post-hospital coaching via telephone on specific HF home care skills using teach-back strategies. Prior to the first telephone session, each family received the coaching program materials by mail: (1) two AHA home caregiving guides (symptoms checklist and staying healthy guidelines for caregivers); (2) a list of local support organisations; (3) the national award winning book <i>Comfort of Home for Chronic Heart Failure: A Guide for Caregivers</i>; (4) low-sodium booklet, and (5) a plastic daily pill organiser. Intervention protocols ensured consistency and fidelity of the intervention delivery.</p> <p>Telephone coaching sessions:</p> <p>The nurse interventionist engaged each dyad in four weekly FamHFCare coaching sessions scheduled at their convenience. Each telephone session lasted from 60 to 90 min; depending on caregivers' questions and need for reinforcement</p>	Standard care: includes the education and materials routinely given to all HF patients through hospital discharge planning.

**Table 2** Summary of Outcomes

Source	Study Design	Scales/Measures Used	Findings
Etemadifar et al <sup>24</sup>	RCT	Zarit Burden Interview	Caregiver burden considerably decreased after the intervention up to the end of the program in the intervention group ( $P=0.000$ after intervention and after 3 months). However, family caregivers in the control group had substantial increases in their burden scores during the same period ( $P=0.0105$ ). These issues suggest that this program not only resulted in a reduction in the family caregivers' burden after the intervention but also prevented an increase of burden in the control group.
Hu et al <sup>25</sup>	RCT	1) Zarit Burden Interview 2) Short Form 36 (SF-36) 3) Centre-for Epidemiologic Studies Depression Scale	There were significant improvements in caregiver burden ( $P=0.0001$ ), mental health( $P=0.0010$ ), and depression ( $P=0.000$ ) after post-test and 3 months after post-test in the experimental group. However, there was no significant improvement in caregivers' physical health at either 3 or 6 months following discharge.
Lijeroos et al <sup>26</sup>	RCT	1) SF-36 2) Caregiver Burden Scale 3) Beck Depression Inventory 4) Control Attitude Scale	There were no significant differences in any index of caregiver burden or morbidity among the partners in the intervention and control groups after 24 months. Overall, the mean total caregiver burden was found to be significantly increased compared to baseline in both groups
Chiang et al <sup>15</sup>	Quasi-experimental	1) Mastery of Stress Scale 2) Feetham Family Functioning Scale 3) Caregiver Burden Inventory	Family caregivers in both groups had significantly lower burden, higher stress mastery, and better family function at one-month follow-up compared to before discharge. The total score of caregiver burden, stress mastery and family function was significantly improved for the family caregivers in the experimental group compared to the comparison group at posttest. Two subscales of family function—Relationships between family and subsystems and relationships between family and society were improved in the experimental group compared to the comparison group, but relationships between family and family members were not different.
Dionne-Odom et al <sup>27</sup>	RCT	1) 15 Item Bakas Caregiver Outcome Scale 2) Hospital Anxiety and Depression Scale 3) Montgomery-Borgatta Caregiver Burden Scale 4) PROMIS Global Health Instrument 5) Positive aspects of caregiving	This 2-site randomised clinical trial of a telehealth intervention for family caregivers of patients with advanced heart failure, more than half of whom were African American and most of whom were not distressed at baseline, did not demonstrate clinically better quality of life, mood, or burden compared with usual care over 16 weeks
Ng et al <sup>28</sup>	RCT	1) Zarit Burden Interview (ZBI)	A statistically significant between-group effect was found, with the HPHF group having significantly higher McGill QOL total score than the control group ( $p=0.016$ ) and there was significant group $\times$ time interaction effect ( $p=0.032$ ). There was no significant between-group effects detected for the measures of symptom distress or functional status at 12 weeks. The intervention group had higher satisfaction ( $p=0.001$ ) and lower caregiver burden ( $p=0.024$ ) than the control group at 12 weeks
Barutcu et al <sup>20</sup>	Quasi-experimental	1) DOBI 2) Beck Depression Inventory	Caregivers in the intervention group had significantly lower burden scores compared with the control group in all subdimensions except objective personal care, in terms of the group $\times$ time interaction in a statistical way ( $P < 0.05$ ). Caregivers in the intervention and control groups had similar scores of depression symptoms ( $P > 0.05$ ). The burden of caregivers in the intervention group showed a statistically significant decrease compared with the pre intervention in all dimensions at 3 months.
Srisuk et al <sup>29</sup>	RCT	1) Control Attitudes Scale Revised (CAS-R) 2) Short-Form 12 health survey	Patients and caregivers who received the education programme had higher knowledge scores at three and six months than those who received usual care. Among those who received the education programme, when compared with those who received usual care, patients had better self-care maintenance and confidence, and health-related quality of life scores at 3 and 6 months, and better self-care management scores at six months, whereas caregivers had higher perceived control scores at three months.

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**Table 2** (Continued).

Source	Study Design	Scales/Measures Used	Findings
Fathani et al <sup>30</sup>	RCT	1) SF36	No statistically significant difference was observed between the groups in terms of demographic characteristics and eight domains of SF-36 at the beginning of the study. One month after the designated educational intervention, Total mean score of quality of life was 81.82±2.75 in the intervention group and 75.97±4.36 in the control group, which had a statistically significant increase compared to before the intervention ( $p<0.001$ ).
Borji et al <sup>21</sup>	Semi-experimental	1) Beck Anxiety	The result showed a difference between the level of anxiety in two groups after the intervention ( $P = 0.001$ ). Anxiety level in the experimental group three weeks after intervention ( $27.88 \pm 7.10$ ) was significant in comparison with before intervention ( $45.06 \pm 5.79$ ) ( $P = 0.001$ ). According to the results, the spiritual intervention reduced the anxiety level in the caregivers of patients with HF.
Bakitas et al <sup>31</sup>	Pilot clinical (single arm)	1) HADS 2) PROMIS 3) BCOS 4) MBCB 5) PAC	Patients experienced moderate effect size improvements in QOL, symptoms, physical, and mental health; caregivers experienced moderate effect size improvements in QOL, depression, mental health, and burden. Small-to-moderate effect size improvements were noted in patients' hospital and ICU days and emergency visits.
Lang et al <sup>19</sup>	RCT	1) HADS 2) CBQ-HF 3) CC-SCHFI 4) Family Caregiver Quality of Life Scale Questionnaire 5) EQ-5D-5L	Caregiver outcome: There were indications of a favourable intervention effect for some outcomes including HADS and CBQ-HF emotional and CC-SCHFI maintenance domain scores.
Piette et al <sup>16</sup>	RCT	1) Caregiver Strain Index 2) CES-D 3) Health and Retirement Survey	mHealth+CP CarePartners reported less caregiving strain than controls at both 6 and 12 months (both $p\leq.03$ ). That effect as well as improvements in depressive symptoms were seen primarily among CarePartners reporting greater burden at baseline ( $p \leq.03$ for interactions between arm and baseline strain/depression at both endpoints). While most mHealth+CP CarePartners increased the amount of time spent in self-care support, those with the highest time commitment at baseline reported decreases at both follow-ups (all $p<0.05$ ). mHealth+CP CarePartners reported more frequent attending of patients' medical visits at 6 months ( $p=0.049$ ) and greater involvement in medication adherence at both endpoints (both $p\leq.032$ ).
Gary et al <sup>32</sup>	RCT	1) BAKAS 2) Caregiver strain	Family Caregivers (FCGs) in the PE+ EX showed significant improvement in 6-min walk distance. Handgrip, and lower extremity strength compared with the PE and UCAC groups. The combined group had the greatest improvement in caregiver perceptions. FCGs in the PE + EX group improved the most in physical function and caregiver perception outcomes.
Sebern et al <sup>22</sup>	Quasi-experimental (one group)	(1) State-Trait Anxiety Scale 2) PHQ-9 3) Shared Care Instrument-3 (SCI-3) 4) SF36	The Shared Care Dyadic Intervention was acceptable to both care partners and the data supported improved shared care for both. For the patient, there were improvements in self-care. For the caregivers, there were improvements in relationship quality and health.
Ågren et al <sup>23</sup>	RCT	1) SF-36 2) Beck Depression Inventory (BDI) 3) Control Attitude Scale (CAS) 4) European Heart Failure Self-Care Behavior Scale (EHFscBS) 5) Caregiver Burden Scale (CBS)	Baseline sociodemographic and clinical characteristics of dyads in the experimental and control groups were similar at baseline. Significant differences were observed in patients' perceived control over the cardiac condition after 3 ( $P < 0.05$ ) but not after 12 months, and no effect was seen for the caregivers. No group differences were observed over time in dyads' health-related quality of life and depressive symptoms, patients' self-care behaviours, and partners' experiences of caregiver burden. Integrated dyad care focusing on skill-building and problem-solving education and psychosocial support was effective in initially enhancing patients' levels of perceived control. More frequent professional contact and ongoing skills training may be necessary to have a higher impact on dyad outcomes and warrants further research.

Ågren et al <sup>23</sup>	Pilot RCT	1) CBS 2) DOBI	No significant differences were found in the performance of caregiving tasks and perceived caregiver burden in the control versus the intervention group.  A pilot study exploring the effects of a psycho-educational intervention in patients and their partners did not reveal significant effects with regard to reduced feelings of burden in partners. Alleviating caregiver burden in partners may need a more intense or specific approach.
Lofvenmark et al <sup>34</sup>	RCT	1) HADS 2) Cantril Ladder of Life 3) SWED-QUAL 4) ISSI 5) SOC	No significant differences in anxiety, depression or quality of life between the intervention group and control group. Adequacy of social networks was the only independent variable that explained levels of anxiety and depression after 12 months beyond baseline levels of anxiety and depression.
McMillan et al <sup>17</sup>	Two group mixed methods comparative experimental design	1) MSAS HF 2) POMS 3) CDS 4) CQOL	No significant effect from the COPE-HF intervention on caregiver or patient variables when piloted with this small sample of hospice patients with HF and their family caregivers.
Wingham et al <sup>18</sup>	RCT	1) Health-related quality of life (EQ-5D-5L) 2) Family Caregiver Quality of Life Scale questionnaire (FamQoL) 3) Caregiver Burden Questionnaire HF (CBQ-HF) 4) Caregiver Contribution to Self-care of HF Index questionnaire (CC-SCHFI) 5) Hospital Anxiety and Depression Scale (HADS) 6) Qualitative interviews	Qualitative interviews showed that most caregivers who received the REACH-HF intervention made positive changes to how they supported the HF patient they were caring for, and perceived that they had increased their confidence in the caregiver role over time.  Provision of the REACH-HF intervention for caregivers of HF patients improved their confidence of self-management and was perceived for some to be helpful in supporting their caregiver role.
Piamjariyakul et al <sup>14</sup>	Mixed method, random assignment	1) Caregiver self-report chronic health conditions 2) Confidence in providing HF home care (4-item Likert type scale) 3) Preparedness in providing HF home care (1-item Likert type scale) 4) Perceived Social Support (1-item Likert type scale) 5) Caregiver Burden of HF home care management (5-point Likert-type scale) 6) CES-D	At 6 months, compared to standard care, the intervention group had significantly fewer HF rehospitalizations, while caregiver confidence and social support scores were significantly higher, and caregiver depression were significantly lower. Caregivers rated the FamHFcare as helpful.  The FamHFcare intervention was associated with fewer HF patient rehospitalizations and improved caregiver outcomes.

## Types and Features of Interventions

Across the 21 studies, three main types of interventions were identified: 1) Education, 2) Psychoeducation and 3) Counseling. Table 1 provides a detailed overview of the characteristics of included studies.

Overall, the three main types of interventions were found to be delivered either synchronously, asynchronously or both. Asynchronous delivery methods did not involve real-time interaction between caregivers and educators. Caregivers were usually provided with educational material and resources that they could contend with at their own times and own targets and as such learning is carried out independently and flexibly. Synchronous delivery methods involve real-time interaction between caregivers and educators who are usually health care professionals.

The targets of most interventions were both the patient and their caregiver, with 10 interventions involving both parties. Four studies were dyadic, involving the patient and their caregiver or partner as a dyad and seven studies involved only the caregiver.

### Education

Among the 21 studies, five studies,<sup>14–18</sup> incorporated only education as a main type of intervention, whereby education entailed the dissemination of information related to heart failure. This includes symptom and risk factor management, dietary and lifestyle advice.

Three of the studies<sup>15,16,18</sup> delivered the educational intervention asynchronously, while two of the studies<sup>14,17</sup> had both synchronous and asynchronous delivery. One of the studies<sup>15</sup> involved a device that tracked the symptoms of the patient, which allowed easier management and monitoring of symptoms, creating lower caregiver burden ( $p=0.382$ ), higher stress mastery and better family function. Another study<sup>16</sup> involved a telehealth application that automatically e-mails summaries and suggestions for self-care to the patient's caregiver/partner. This reduced caregiving strain at both six and 12 months (both  $p\leq 0.03$ ) and improved depressive symptoms among caregivers/partners who reported greater burden at baseline ( $p\leq 0.03$ ). Wingham et al used a program manual, progress tracker and 'family and friends' resource delivered in-person and over phone calls over 12 weeks, improving confidence of caregivers' self-management.

The two studies<sup>14,17</sup> that used both synchronous and asynchronous delivery of educational materials involved text materials, telehealth support and phone calls. These caused no significant effect in McMillan et al, while Piamjariyakul et al saw significantly improved caregiver confidence and social support scores, and caregiver depression was significantly lower.

Two studies<sup>14,16</sup> used a dyadic intervention for patient and caregiver, with Piette et al being a Self-Care Dyadic Intervention, which improved emotional wellbeing for caregivers (effect size=0.51), while Piamjariyakul et al used telephone coaching, caregiving guides, list of local support organizations, a resource book, low-sodium booklet and a daily pill organizer. Piamjariyakul et al's resource-rich approach was found to lower caregiver depression significantly ( $M-Wz=-2.4$ ,  $p=0.01$ ) while increasing caregivers' social support ( $M-Wz=2.4$ ,  $p=0.01$ ).

### Psychoeducation

One study<sup>19</sup> incorporated only psychoeducational intervention and support as the main intervention, which was delivered asynchronously. Psychoeducation includes the teaching of coping and self-care strategies, like stress and anxiety management. Lang et al involved text materials, multimedia and phone calls, with a cardiac nurse facilitating the completion of the manual with the patient and caregiver over 12 weeks. This improved caregiver depression and alleviated caregiver burden.

### Counseling

Four studies<sup>20–23</sup> incorporated synchronous counseling as the main intervention. Counseling encompasses a health professional helping caregivers to find, cope, work through and manage the problems they face. Counseling also entails the provision of a platform for caregivers to communicate and discuss their concerns and issues in relation to their role as a caregiver, which can be done through peer-support groups, forums and dyadic interventions. One study<sup>20</sup> involved the implementation of support group meetings that promoted discussions about caregiver problems and solutions, which reduced caregiver burden scores ( $p<0.05$ ) in all dimensions except objective personal care. Caregiver depression scores remained the same ( $p>0.05$ ). Another study<sup>21</sup> incorporated a spiritual approach that provided spiritually guided strategies

and advice to cope with problems, such as teaching about trust, patience, forgiveness, friendship, recitation and praying which reduced the anxiety level ( $p=0.001$ ) of caregivers of patients with HF.

Two studies<sup>22,23</sup> implemented a dyadic intervention that involved both caregiver and patient, delivered through face-to-face sessions between dyads and a multidisciplinary team. Sebern et al's dyads were invited to discuss situations that cause stress and talk about the possible effects on their relationship and their mutual need for support. This did not show any significant changes in caregiver burden measured by CBS and DOBI ( $p$  varying from 0.08 to 0.99). Agren et al's intervention teaches and supports caregiver problem solving by provision of a reference book, review of the use of problem-solving principles by an intervention nurse, two calls made by an intervention nurse to discuss and review problems and possible solutions and intervention visits. However, this also did not improve caregiver depression (POMS mean=8.4 baseline, 8.9 at three weeks, 9.9 at four weeks) and caregiver quality of life (CQOL mean=43.2 baseline, 40.8 at three weeks, 40.2 at four weeks) significantly enough. These two dyadic interventions that integrated counseling did not produce significantly positive results on caregiver burden, caregiver depression and quality of life.

### Combination of Interventions

Eleven studies<sup>24-34</sup> incorporated either two or three main types of interventions. Two studies<sup>25,29</sup> incorporated both education and counseling, while seven studies<sup>24,26,27,30-32,34</sup> incorporated both education and psychoeducation.

Two studies<sup>28,33</sup> incorporated education, counseling and psychoeducation. Ng et al involved regular home visits and telephone calls, while Agren et al involved face-to-face sessions with professionals and telephone visits. These lowered caregiver burden in Ng et al ( $p=0.024$ ), while in Agren et al, there was no significant difference found ( $p$  varying from 0.08 to 0.99).

### Impact of Interventions

Across the 21 studies, none of the studies reported a significant improvement in all three outcomes of (i) Quality of Life, (ii) Depression and Anxiety, and (iii) Loneliness, while only three studies<sup>16,22,25</sup> reported a significant improvement in two outcomes. Eight studies<sup>14,15,20,21,24,28,30,32</sup> reported a significant improvement in only one outcome.

### Quality of Life

Quality of life amongst caregivers was measured as an outcome by 20 of the 21 studies. Across the 20 studies, 20 different scales were used to measure the outcome of QOL, with most studies using more than one type of scale to do so.

Of the 20 studies that measured QOL, nine studies<sup>15,16,20,22,24,25,28,30,32</sup> reported a significant improvement in caregiver burden and overall QOL post-intervention. Additionally, three other studies<sup>18,19,31</sup> reported moderate improvements in QOL after the intervention.

### Depression and Anxiety

Depression amongst caregivers was measured as an outcome by 14 of 21 studies. Out of which, five studies used the Hospital Anxiety and Depression Scale (HADS), three studies used the Centre for Epidemiology Depression Scale (CESDP), three studies used the Beck Depression Inventory (BDI). The remaining three studies used the Profile of Mood States (POMS) Scale, Beck Anxiety and State Trait Anxiety Scale. Of the 14 studies, five studies<sup>14,16,21,22,25</sup> reported a significant improvement in depressive symptoms, three studies<sup>18,19,31</sup> reported moderate to slight improvements in depressive symptoms, and six studies<sup>17,20,26,27,33,34</sup> reported no significant improvement in depressive symptoms post-intervention.

Anxiety amongst caregivers was measured by two of 21 studies, one of which used the Beck Anxiety Inventory (BAI) and the other used the State Anxiety Scale. One of the studies<sup>21</sup> reported a significant decrease in anxiety levels amongst caregivers post-intervention, while the other study<sup>22</sup> did not report any changes in anxiety levels in caregivers at baseline and post-intervention.

## Loneliness

Loneliness amongst caregivers was measured as an outcome by three of 21 studies.<sup>23,26,33</sup> All three studies used the Caregiver Burden Scale-22 (CBS-22) to measure loneliness. All three studies found that loneliness amongst caregivers was not significantly improved by the interventions.

## Discussion

### Caregiver Burden and Quality of Life

The ten interventions that caused a significant improvement in caregiver burden and QOL involved education, psychoeducation, peer-support groups and professional tele-support. However, the seven studies that did not report significant changes in caregivers' QOL also involved the same interventions, with four of them having a dyadic structure.

This suggests that although education and psychoeducation may significantly improve caregiver QOL, the method of intervention delivery is also important. Text materials were not correlated with improved QOL, while phone calls and multimedia proved to be more effective. Delivery methods such as text materials are not correlated with improved QOL, while phone calls and multimedia proved to be more effective. On top of that, dyadic interventions seem to have little to no effect on improving caregiver burden and QOL, as seen in the four studies with dyadic interventions. Studies that produced positive results were also generally from the Asia-Pacific region, which suggests that other factors such as culture may also influence the effectiveness of such interventions.

### Depression and Anxiety

The five interventions that reported improvements involved education, peer-support groups and professional tele-support. The other six studies that did not report any significant changes or improvements in depressive symptoms employed psychoeducation, dyadic psychosocial interventions, education and professional tele-support. There are no specific intervention modalities that are consistently correlated with improvement in depressive symptoms, hence external factors such as context and patient attitudes may be the cause of inconsistent results. It seems that disease education, tele-support and peer-support groups can reduce depression amongst caregivers; however, the effectiveness of these interventions may depend on methods of delivery and other factors. It could also be possible that these interventions influenced the caregiving burden, which in turn influenced the caregiver's depression, hence the correlation is unclear.

As for anxiety, only one study<sup>21</sup> that employed a spiritually driven intervention reported significant improvements in anxiety, while the other study<sup>22</sup> involving a dyadic intervention did not report any significant changes in anxiety levels. It could be suggested that spiritual care alleviates anxiety; however, such generalised conclusions may be premature, considering that the study focused on Islam-related spiritual care. Hence, other religious domains and faiths have to be studied to conclude consistency across religions. In the study<sup>22</sup> that did not report any significant changes in anxiety, it must be noted that caregivers' baseline anxiety levels were already low to begin with; hence, the employment of a dyadic intervention may not have had much of an effect. Other intervention modalities could be trialed to assess efficacy in alleviating anxiety in caregivers with high baseline anxiety levels.

## Loneliness

The three studies that measured loneliness as an outcome did not include peer-support groups in their intervention. Two of these studies involved dyads of patient and caregiver, which could be seen as a form of social support, however the patient and caregiver were known to each other before the study, hence widening of the caregiver's social circle with new social contacts has not been studied.

Loneliness could also see little improvement due to the limitations in CBS in measuring caregiver's loneliness. As all three studies used CBS to measure this outcome, this is a potential mismatch of scale to outcome, which weakens the correlation between the interventions and caregivers' loneliness.



## Limitations of Review

A limitation of our review is the heterogeneity in measures of effect, such as questionnaires employed in each study. Inter-study variability is introduced as a result.

The findings of studies also need to be contextualized to the country and community. It is suggested that each study can be conducted on the background of different pre-existing support schemes and resources, so as to take into account important factors like cultural acceptance and availability of social support.

While evaluating interventions based on their results, the availability of resources such as time and manpower have to be evaluated too, as these enable the intervention to be implemented successfully. Certain countries could have deficits in resources or manpower, which led to difficulty in implementing interventions or limitations in the quality of interventions provided. On top of that, the generalizability of the results should also be tested, as an intervention may not be effective when applied to other countries, cultures and demographics. This would require even more resources, which would be a limitation for lower-developed countries, which may already be those with the highest needs.

The evaluation of interventions was narrowed by focusing on three main outcomes alone while other domains of analysis (eg, Self-Care) were excluded. As such, interventions that may not have yielded promising results as per our analysis may potentially be effective in improving other outcomes and vice versa.

Lastly, the methodology of our study was limited as only studies available in English were included. While grey literature was not considered in order to ensure the rigour of included studies, the breadth of studies would be limited.

## Recommendations

The effectiveness of interventions is substantially dependent on the mode of its delivery; synchronous or asynchronous. Both synchronous and asynchronous delivery methods have a fair share of advantages and disadvantages. For instance, asynchronous methods tend to be more cost and resource effective, it can transcend temporal and geographical barriers, but at the same time it reduces caregiver-physician real-time interaction.<sup>35</sup>

Apart from weighing out such advantages and disadvantages of asynchronous and synchronous delivery methods before deciding on a delivery method for an intervention, other factors should also be considered. Factors such as attitudes of both physicians and caregivers towards asynchronous and synchronous delivery methods, competencies of physicians and caregivers in navigating through such methods,<sup>36</sup> age and even the type of outcome being targeted must also be considered.

It has been found that asynchronous and synchronous delivery methods tend to be more effective for specific types of outcomes. When it comes to outcomes such as self-care and disease management, asynchronous delivery methods have been cited to be more effective while for outcomes such as quality of life, a combination of synchronous and asynchronous methods have been cited to be more effective.<sup>37</sup> For outcomes such as depression, asynchronous methods are less commonly deployed since improvement in clinical outcomes like depression may require factors such as establishment of a therapeutic patient-physician alliance<sup>38</sup> can only be offered through asynchronous interventions. However, a growing number of literature have suggested that asynchronous methods are efficacious in improving mental health outcomes such as depression, though more RCTs need to be conducted to further ascertain this claim.<sup>35</sup> In all, it is important to evaluate the pros and cons of both delivery methods to choose a suitable one for an intervention. On top of that, other factors such as the demographics of the caregivers, type of outcome being targeted must also be taken into consideration to ensure that an intervention yields promising results.

Next, a holistic approach in the implementation of interventions can be adopted. Naturally, there are many factors that influence the effectiveness of interventions. For instance, individual preferences and ingrained cultural practices may influence perceptions and attitudes towards an intervention.<sup>39</sup> This can perhaps be addressed by including incentives or by involving community leaders who may be better positioned to help change attitudes and perceptions towards interventions. As such, recognizing the nuanced needs of subpopulations would allow interventions to be tailored and personalized accordingly to ensure optimal effectiveness.

## Conclusion

Patients with congestive cardiac failure often necessitate dedicated care and support. Patients often suffer debilitating effects on health and have to integrate both lifestyle and medical management into their daily lives. Patients themselves are often plagued with stress and depression coping with their condition.

The difficulties of informal caregivers, likewise, are often overlooked in their struggle of caring for patients. To ameliorate the various psychosocial stressors of caregivers would require a multi-faceted approach, often involving education, support and counseling. This review has outlined the various programs and interventions implemented in communities around the world in efforts to improve psychosocial outcomes in caregivers.

## Disclosure

The authors report no conflicts of interest in this work.

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