Evidence for Therapeutic Patient Education Interventions to Promote Cardiovascular Patient Self-Management

A Scientific Statement for Healthcare Professionals
From the American Heart Association

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Background—The burden of cardiovascular disease as a chronic illness increasingly requires patients to assume more responsibility for their self-management. Patient education is believed to be an essential component of cardiovascular care; however, there is limited evidence about specific therapeutic patient education approaches used and the impact on patient self-management outcomes.

Methods and Results—An integrative review of the literature was conducted to critically analyze published research studies of therapeutic patient education for self-management in selected cardiovascular conditions. There was variability in methodological approaches across settings and disease conditions. The most effective interventions were tailored to individual patient needs, used multiple components to improve self-management outcomes, and often used multidisciplinary approaches.

Conclusions—This synthesis of evidence expands the base of knowledge related to the development of patient self-management skills and provides direction for more rigorous research. Recommendations are provided to guide the implementation of therapeutic patient education in clinical practice and the design of comprehensive self-management interventions to improve outcomes for cardiovascular patients. (Circ Cardiovasc Qual Outcomes. 2017;10:e000025. DOI: 10.1161/HCQ.0000000000000025.)

Key Words: AHA Scientific Statements ■ patient education ■ self-management ■ therapeutics

Although the overall rate of death associated with cardiovascular disease (CVD) continues to decline in the United States,1–3 CVD is a leading cause of mortality and disability. The burden of CVD remains high, underscoring the need to improve long-term management of CVD as a chronic illness. Effective implementation of current treatment guidelines for primary and secondary prevention of CVD relies heavily on patient knowledge and engagement in carrying out the plan of care. Healthcare reforms have increasingly shifted the responsibility for self-management to patients and families as hospital stays and ambulatory visits have become shorter and less frequent.

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This statement was approved by the American Heart Association Science Advisory and Coordinating Committee on February 27, 2017, and the American Heart Association Executive Committee on April 17, 2017. A copy of the document is available at http://professional.heart.org/statements by using either “Search for Guidelines & Statements” or the “Browse by Topic” area. To purchase additional reprints, call 843-216-2533 or e-mail kelle.ramsay@wolterskluwer.com.


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Therapeutic patient education (TPE) is an approach to facilitate patient and family learning about the treatment of disease and the adoption of self-management behaviors and lifestyles to improve physical and psychosocial health outcomes (eg, biomarkers, quality of life). The goal of TPE is to improve health outcomes, including by preventing avoidable complications. In prior studies, investigators have reported the positive impact of TPE on knowledge, behavioral, psychosocial, and health outcomes; however, there is a gap in understanding how TPE mechanisms impact specific self-management outcomes (eg, cardiac condition or disease clinical indicators and health behaviors). Furthermore, it is unclear what strategies are useful to address TPE barriers (eg, health literacy, cognition). These gaps in evidence related to TPE underscore the need to examine research evidence to provide recommendations for TPE to improve self-management of CVD by patients and families.

**Review of Literature**

**TPE for Self-Management**

Self-management of CVD and other chronic diseases requires patients to have (1) knowledge of their disease process and management, (2) self-management skills to apply this knowledge to their daily life, and (3) confidence that they can sustain self-management behaviors to maintain and improve their health status. TPE can overcome limitations of traditional patient education to support CVD self-management.

The purpose of this scientific statement is to critique, analyze, and synthesize TPE evidence pertaining to self-management in selected cardiac patient populations: CVD (acute coronary artery syndrome [ACS], hypertension, atrial fibrillation [AF], heart failure [HF]) and CVD treatments (ie, coronary artery bypass graft surgery [CABG] and percutaneous coronary intervention [PCI]). Patients with these cardiovascular conditions often experience acute, unexpected hospitalizations, readmissions, and complications that are potentially preventable with improvements in self-management skills. Effective TPE could also have a role in delaying the progression of CVD by facilitating medication adherence and adoption of healthy lifestyles. This synthesis of research evidence expands the science of self-management and provides evidence-based recommendations that can be used to design TPE self-management programs for improved outcomes of patients with CVD. Our integrative review of the literature addresses 3 questions for patients with CVD:

1. What TPE interventions have been used to promote self-management in select cardiovascular populations?
2. What is the impact of TPE for self-management on outcomes for select cardiovascular populations?
3. How are common barriers to implementing TPE for cardiovascular patients managed?

**Methodology**

An integrative review of literature was conducted of published research on cardiovascular self-management TPE interventions and barriers. An integrative review methodology is particularly useful when there is a body of existing literature on a robust or mature topic such as TPE with diverse approaches in different CVD populations. Integrative review methods as recommended by Ganong were used to ensure rigor (eg, purpose, inclusion criteria, literature search, sampling decisions, systematic analysis, reporting). In addition, updated methodologies for integrative reviews by Whittemore and Knafl (eg, data reduction, data comparison) were used to synthesize evidence. Two or more of the writing committee members reached consensus on final evidence abstracted from each article, as recommended by guidelines from the Joanna Briggs Institute.

Articles included for this integrative review met the following inclusion criteria: (1) implementation of TPE self-management interventions for CVD (ACS, hypertension, HF, and AF) and CVD treatments (CABG or PCI); (2) inclusion of self-management–related outcomes; (3) conducted in either inpatient or outpatient settings, including home-based or telehealth-delivered interventions; and (4) quantitative studies (systematic reviews, randomized controlled trials [RCTs], quasi-experimental prospective studies, retrospective controlled trials, controlled before and after studies, and comparative or descriptive reports). Published articles were excluded if they addressed (1) studies of stroke (cerebrovascular accident) populations, (2) intervention studies limited to pharmacological management, (3) interventions that targeted only the provider or health professional, (4) organizational or systems interventions to improve delivery of care, (5) lifestyle modification or coronary artery disease (CAD) risk factor modification in lieu of cardiac rehabilitation after an acute cardiac event (ACS, CABG or PCI), or (6) cardiac rehabilitation implementation and evaluation. Non-English published articles were also excluded.

Database searches of publications from 2000 to 2015 were conducted of MEDLINE, PubMed, EMBASE, CINAHL, the Cochrane Library, and PsychINFO, as well as Google Scholar for scholarly literature. Key search terms included the following: quantitative, clinical trials, behavioral interventions, self-management, self-care, self-regulation, patient education, therapeutic patient education, self-monitoring, behavior change, patient/behavioral counseling, teach back, motivational interviewing, self-efficacy, symptom management, and associated MeSH terms. Additional search terms for each of the cardiovascular conditions or diseases (eg, hypertension, myocardial infarction, ACS, CABG, PCI, acute cardiac event, atrial fibrillation, heart failure) and barriers to TPE (health literacy, cognition, and time barriers) were also used. A manual search of journals using a snowball technique was used to review reference lists for additional relevant studies.

The Figure provides an overview of the number of studies searched and final inclusion of studies for each CVD population. Findings from the integrative review of literature are summarized by each of the 4 selected CVD populations and by barriers to TPE.

**Evidence Findings**

**Question 1: What TPE Interventions Have Been Used to Promote Self-Management in Select Cardiovascular Populations?**

**Hypertension**

Although the diagnosis of hypertension might be made when a patient experiences a concurrent stroke or an acute cardiac
event (eg, ACS, cardiac revascularization), it is more common for patients with hypertension to be asymptomatic and diagnosed during a primary care visit. Lack of symptoms presents a unique challenge to actively engaging patients in hypertension self-management. Hypertensive patients must develop skill for medication adherence, self-monitoring of blood pressure (SMBP), and lifestyle behavior management (low-sodium and low-fat diet, exercise, reduced alcohol use, smoking cessation, weight management, regular healthcare provider visits, and stress management).26 In this review of evidence, TPE for patients with hypertension focused on primary care or community care and interventions that targeted patient/client self-management, as reported in Table 1.27-42

SMBP31–33,35,42 by hypertensive patients for self-management is recommended by the Joint National Committee on Detection, Prevention, Evaluation, and Treatment of High Blood Pressure.43 Five studies,31–33,35,42 including 4 systematic reviews,31,32,42 a meta-analysis,33 and 1 RCT,35 used SMBP as a stand-alone intervention in conjunction with routine patient education and counseling for hypertensive patients. SMBP study protocols, processes, and methods of communication with hypertensive patients varied widely across these studies, which limits the generalizability of SMBP as a stand-alone global intervention alone for hypertension self-management.

Five articles27,29,30,37,38 reported combinations of SMBP, behavioral counseling, or telemedicine interventions for hypertensive patients. Telemetering interventions included use of SMBP and telephone counseling,37 SMBP plus weight and exercise self-monitoring,30 SMBP in combination with telecounseling that targeted blood pressure [BP] goals,27 use of medication protocol adjustments that targeted BP goals and BP transmitted from SMBP by participants,38 and SMBP plus tailored lifestyle modification (eg, DASH [Dietary Approaches to Hypertension] diet, medication use).29

Behavioral interventions reported in 6 articles28,34,36,39–41 did not include the use of SMBP. Nurses most frequently provided the TPE to patients with hypertension, delivering TPE by telephone or in person. Behavioral research interventions included hypertension self-management–tailored education based on stage of change,34 culturally appropriate nurse-led lifestyle interventions for African immigrants,28 Mediterranean diet counseling and ambulatory BP monitoring,36 and the use of self-affirmation to overcome medication adherence barriers.39 Two studies implemented team-led and team-delivered behavioral interventions. Team approaches in 2 studies included participants’ use of a hypertension self-management tool kit (eg, pedometer, BP monitoring wallet card)40 and use of motivational interviewing in the clinic and with follow-up telephone peer coaching.41

CVD and CVD Treatment
In total, only 7 articles44-50 focused on TPE interventions for CVD patients who experienced acute CVD events (eg, ACS) and underwent CVD treatment (CABG or PCI; Table 2). Interventions in 5 of these studies focused on symptom management. Three studies emphasized use of an action or response plan for managing ACS symptoms by cardiac patients who had been hospitalized and experienced an acute cardiac event.44-46 Of the other 2 studies, 1 implemented an exercise- and audio-based relaxation intervention to manage impaired
<table>
<thead>
<tr>
<th>Study (Year)</th>
<th>Design</th>
<th>Intervention Components</th>
<th>Delivery</th>
<th>Duration</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artinian et al27 (2007)</td>
<td>2-Group experimental, longitudinal design with block-stratified randomization N=387 I=194 C=193</td>
<td>Telemonitoring device for BP self-monitoring RN telecounseling follow-up re: BP readings</td>
<td>RN home visit for education about telemonitoring of BP Telemonitoring of BP by patient weekly ×3 mo and monthly from month 4 to month 12</td>
<td>12 mo</td>
<td>Reductions in both SBP (P=0.04) and DBP (P=0.12)</td>
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<tr>
<td>Beune et al28 (2014)</td>
<td>Cluster-randomized trial N=146 I=75 C=71</td>
<td>Culturally adapted education/ counseling for blacks Printed education materials</td>
<td>In person, delivered by trained nurses</td>
<td>Three 30-min sessions</td>
<td>Reductions in DBP (P=0.03) Improved use of lifestyle recommendations (P=0.003) Mean medication adherence NS</td>
</tr>
<tr>
<td>Bosworth et al29 (2009)</td>
<td>2×2 Randomized trial, stratified by site N=636 C=159 Behavioral=160 Home BP=158 Combined=159</td>
<td>Education/counseling Home BP monitoring</td>
<td>RN phone calls for education bimonthly Home BP instruction and follow-up every 6 mo</td>
<td>24 mo</td>
<td>Combined intervention group had greatest sustained reduction in BP over 24 mo (SBP: P=0.010; DBP: P=0.009) Largest number of patients in combined intervention group adhering to completed BP logs</td>
</tr>
<tr>
<td>Bove et al30 (2013)</td>
<td>RCT N=241 I=120 C=121</td>
<td>Telemedicine (Internet and telephone based) for BP and weight self- monitoring BP goal setting</td>
<td>Telemedicine reporting of BP Patient-provider feedback re: BP goals</td>
<td>6 mo</td>
<td>NS differences in BP goal achieved or reduction in BP, but telemedicine group had greater improvements, particularly among nondiabetic patients</td>
</tr>
<tr>
<td>Bray et al31 (2010)</td>
<td>RCT=25 N=7078 I=3427 C=3651</td>
<td>Use of SMBP alone or SMBP in combination with other interventions</td>
<td>Varied across studies</td>
<td>Varied across studies included in final meta-analysis</td>
<td>Findings from studies using SMBP alone: Increased potential of meeting target BP (weighted mean difference: SBP –3.82 mm Hg [95% CI, –5.61 to –2.03 mm Hg], DBP –1.45 mm Hg [95% CI, –1.95 to –0.94 mm Hg]) Increased chance of meeting BP goal: RR=1.09 (95% CI, 1.02–1.16)</td>
</tr>
<tr>
<td>Fahey et al32 (2005)</td>
<td>RCT=56 Total N not specified I/C not specified</td>
<td>SMBP (n=15 RCTs) alone or SMBP in combination with: Patient education Provider education RN- or Rph-led care Organizational interventions, (eg, appointment reminder systems)</td>
<td>Varied across studies</td>
<td>Varied across studies</td>
<td>Findings from studies using SMBP alone: Self-monitoring was associated with moderate net reductions in DBP (weighted mean difference –2.0 mm Hg; 95% CI, –2.7 to –1.4 mm Hg)</td>
</tr>
<tr>
<td>Fletcher et al33 (2015)</td>
<td>28 Trials using SMBP N=7021 I/C not specified</td>
<td>SMBP (n=11 RCTs) alone or SMBP in combination with other interventions (eg, education delivered verbally or using printed or online materials; titration protocol, medication reminders)</td>
<td>Varied across studies</td>
<td>Varied across studies, ranged from 2 wk to 12 mo</td>
<td>Pooled analysis of all medication adherence measures demonstrated small but significant overall effect in favor of SMBP: Improved medication adherence (standardized mean difference 0.21; 95% CI, 0.08–0.34) with moderate heterogeneity (I²=43%) Pooled analysis of DBP at 6 mo demonstrated significant overall effect in favor of SMBP: Reduction in DBP (weighted mean difference –2.02 mmHg; 95% CI, –2.93 to –1.11 mmHg), with low heterogeneity (I²=0%)</td>
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<tr>
<td>Friedberg et al\textsuperscript{34} (2015)</td>
<td>RCT N=533 SM=176 HEI=180 UC=177</td>
<td>Behavioral SMI: counseling for exercise, diet, and medications based on stage of change HEI: standard, nontailored information</td>
<td>Monthly counseling phone calls by counselors</td>
<td>6 mo</td>
<td>Findings from studies using SMBP alone: Reduced BP for SMI and HEI groups compared with UC at 6 mo (pairwise comparisons vs UC: P=0.009 for SMI and P=0.047 for HEI) Significantly higher proportion of SMI group had action or maintenance (pairwise comparisons vs UC: P=0.001)</td>
</tr>
<tr>
<td>Hosseininasab et al\textsuperscript{35} (2014)</td>
<td>RCT N=196 I=97 C=97</td>
<td>Wrist BP for SMBP</td>
<td>Follow-up visits</td>
<td>Visits at week 4, 12, and 24</td>
<td>NS differences observed</td>
</tr>
<tr>
<td>Katsarou et al\textsuperscript{36} (2014)</td>
<td>RCT N=45 I=21 C=24</td>
<td>Intervention of combined education on stress management and dietary habits Stress management skills Dietary education</td>
<td>Dietary counseling Psychologist instruction re: stress management</td>
<td>3 appointments over 8 wk</td>
<td>Reduction in SBP (P=0.009) and DBP (P=0.016) and perceived stress (P&lt;0.001) Increased adherence to Mediterranean diet principle (P=0.007)</td>
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<tr>
<td>Kim et al\textsuperscript{37} (2014)</td>
<td>Prospective clinical controlled trial N=440 I=225 C=215</td>
<td>Self-help program for Korean American seniors Education and training re: BP management BP home monitoring Telephone counseling</td>
<td>2-h weekly education delivered by RN x 6 wk Monthly BP feedback by phone calls by bilingual community health workers</td>
<td>12 mo</td>
<td>Improvements at 18 mo Self-efficacy for BP control (P=0.001) HBP knowledge (P=0.001) Depression (P=0.04) Medication adherence (P=0.06)</td>
</tr>
<tr>
<td>McManus et al\textsuperscript{38} (2010)</td>
<td>RCT N=527 I=263 C=264</td>
<td>Self-management intervention including: BP self-monitoring Self-titration of drugs Telemonitoring of BP</td>
<td>2 Training sessions provided by research team for intervention group</td>
<td>12 mo</td>
<td>Reduced SBP (P=0.0004) Increased use of medications (P=0.0001)</td>
</tr>
<tr>
<td>Ogedegbe et al\textsuperscript{39} (2012)</td>
<td>RCT N=256 I=125 C=131</td>
<td>Education workbook Instruction re: positive affect and self-affirmation to improve adherence for blacks</td>
<td>Written education materials Bimonthly telephone counseling</td>
<td>12 mo</td>
<td>Improved medication adherence (P=0.049) NS differences in BP by group</td>
</tr>
<tr>
<td>Svaarstad et al\textsuperscript{40} (2013)</td>
<td>Cluster-randomized trial N=576 I=276 C=300</td>
<td>Counseling/coaching for BP goal attainment Toolkit for medication adherence, including pillbox, strategies to overcome barriers BP monitoring</td>
<td>Pharmacist-technician team visits Feedback to providers</td>
<td>6 mo Mean 4.25 visits</td>
<td>Improved refill adherence (P&lt; 0.001) Reduction in SBP (P&lt; 0.001) BP control (P=0.01)</td>
</tr>
<tr>
<td>Turner et al\textsuperscript{41} (2012)</td>
<td>Single-blind RCT N=280 I=136 C=144</td>
<td>Integrated chronic care model to reduce BP and CVD risk factors Education and counseling Peer coaching Print materials</td>
<td>Computer program on CHD risk Printed materials Peer coaching, including bimonthly phone calls and 2 in-person sessions (15-30 min each)</td>
<td>6 mo</td>
<td>Achieved BP reductions ≥5 mmHg (P=0.01) Absolute reduction in SBP (P=0.003)</td>
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(Continued)
sleep symptoms, and the other symptom management intervention promoted patients’ management of commonly occurring symptoms (eg, pain, poor appetite, leg swelling) after CABG. Two additional studies focused on CAD risk-reduction interventions for PCI patients, which included use of self-efficacy mechanisms and a culturally tailored behavioral intervention to increase positive affect/self-affirmation to promote increased physical activity.

**Atrial Fibrillation**

A majority of the self-management TPE interventions for patients with AF were characterized by improving patients’ knowledge related to AF and medication use of oral anticoagulants (OACs), such as warfarin (Table 3). Participants in studies were adults (55–75 years old) with AF; there was homogeneity of the study populations with respect to patients’ level of education and health literacy. One study used a different type of TPE mechanism than the other studies, by implementing a chronic care model for nurse-led care in a cardiology clinic that incorporated TPE to provide patient education on AF and medication use, as well as an integrated self-management intervention for AF patients using telecare (eg, weight monitoring, heart rhythm monitoring) and ongoing follow-up over time for patients with AF.

There were 6 articles that reported on TPE interventions to increase patients’ knowledge about AF, as a theory-driven intervention, that focused on patients’ understanding of AF as a disease or condition that requires ongoing treatment with OACs. Additional studies focused on the role of OACs in reducing stroke risk, including the related risks and benefits of OACs in the treatment options for AF, use of personal stroke risk calculation, and shared decision making related to OACs. Other TPE interventions focused on the need for self-monitoring (eg, bleeding assessment) and implementation of OAC safe use self-management (eg, nutrition, analgesic use).

**Heart Failure**

Studies of TPE interventions for patients with HF were robust and concentrated on improving self-management. Focuses for improving self-management included knowledge of HF, illness needs, activation of resources, and living with the condition, with a majority of trials focused on living with the condition, which included recognition of changes in HF condition (eg, self-monitoring), adoption of recommended lifestyle changes (eg, diet and fluid modification, use of medications), and support for cognitive restructure related to HF diagnosis.

The most common goal of TPE interventions was to improve patient self-management by promoting recognition of HF signs and symptoms and teaching strategies to integrate recommended therapeutic regimens (eg, medication use and dietary modifications) into lifestyle. Several strategies were implemented to augment self-care skill building, including the use of health literacy–adapted TPE, the use of a symptom management diary to engage patients with symptom monitoring, and modeling and social persuasion. Other TPE interventions provided approaches that included feedback on dietary intake patterns and enhancing medication adherence. The activation of self-management resources (eg, environmental restructuring, eliciting support from family, cognitive restructuring, and relaxation response) and the use of family-focused interventions were other strategies used in other self-management trials to enhance mutual support, communication, and problem-solving skills.

**Summary**

The majority of self-management interventions for cardiovascular patients had multiple components, whereas single-component interventions were focused on the use of SMBP for hypertension self-management. Several self-management studies were delivered by multidisciplinary teams, which reflects the need to manage the chronicity of cardiac patients’ needs over time and across clinical settings. Follow-up to reinforce self-management by cardiac patients was used in a majority of the studies across the select cardiac populations, although duration of follow-up was often limited. Delivery of self-management interventions included 1-to-1 interactions, group interventions, and telehealth-delivered components. Interventions in a few HF studies specifically included dyad

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**Table 1. Continued**

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<tr>
<th>Study (Year)</th>
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<tbody>
<tr>
<td>Uhlig et al (2013)</td>
<td>RCT=52 studies N=2080 I=1051 C=1029</td>
<td>SMBP alone (n=26) or SMBP in combination with other interventions</td>
<td>Varied across studies</td>
<td>Varied across studies</td>
<td>Findings from studies using SMBP alone in meta-analysis: Significant improvement in BP by SMBP participants at 6 mo in studies using SMBP as a single-component intervention compared with UC; summary estimate of net change in BP at 6 mo: –3.9/–2.4 mm Hg (P&lt;0.001/P&lt;0.001; I²=33%/44%); NS differences in BP at 12 mo</td>
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BP indicates blood pressure; C, control; CHD, coronary heart disease; CI, confidence interval; CVD, cardiovascular disease; DBP, diastolic blood pressure; HBP, high blood pressure; HEI, health education intervention; I, intervention; NS, not significant; RCT, randomized controlled trial; RN, registered nurse; Rph, registered pharmacist; RR, relative risk; SBP, systolic blood pressure; SMBP, self-monitoring of blood pressure; SMI, stage-matched intervention; TPE, therapeutic patient education; and UC, usual care.
Barason et al (2009) CABG RCT N=54 I=23 C=31 Outpatient UC vs tailored messages re: symptom monitoring and self-care Tailored messages via telehealth after discharge 6 wk Increased energy expenditure (physical activity: P<0.05) Improved physical (P<0.05) and role-physical functioning (P<0.005) in both groups over time

Broadbent et al (2009) MI RCT N=103 I=52 C=51 Hospital UC vs 1:1 explanation of MI, exploration of causal perceptions, and personal action recovery plan In person by health psychologist before discharge Four 30-min sessions Better understanding of information (P<0.05) More prepared for discharge (P<0.01) Expressed greater intention for rehabilitation (P<0.01) Less anxiety (P<0.05) Fewer phone calls to GP (P<0.01) Return to baseline work status (P<0.05)

Furuya et al (2014) PCI RCT N=90 I=45 C=45 Outpatient UC vs self-efficacy–based education focused on PCI and discharge Coaching re: self-care Print Coaching phone F/U at 1, 8, and 16 wk after discharge 16 wk Improved physiological or psychosocial functioning as measured by SF36: Physical component summary (P<0.009) Physical functioning (P<0.02) Role-emotional (P<0.007) Role-physical (P<0.001)

Gallagher et al (2013) CAD Pre-/post-test design N=137 Outpatient Assessment of knowledge of MI warning signs and response Educational tool with 3-step response plan In-person session delivered by CR staff after completion of CR Duration not specified 1 Outpatient session Improved identification of warning signs of MI (P<0.001) and reported actions to take in response (P<0.001)

Johansson et al (2014) CAD RCT N=53 I=27 C=26 Outpatient UC vs intervention to improve sleep, including: Sleep analysis Education on sleep hygiene CD-based relaxation program Print In-person by RN and PT after discharge Duration not specified 1 Outpatient session Significant improvements in sleep quality (P<0.005), sleep onset (P<0.005), efficiency (P<0.008), and insomnia (P=0.02)

O’Brien et al (2014) ACS RCT I=974 C=973 Outpatient UC vs education session using motivational interviewing with phone follow-up In-person session Phone F/U 1 mo after discharge 40-min session Improvements in knowledge (P<0.001), attitude (P=0.003), and beliefs about ACS (P<0.001)

Peterson et al (2012) PCI RCT N=242 I=124 C=118 Outpatient Culturally tailored education workbook with positive affect Pedometer Behavioral contracts Workbook Telephone F/U at 2, 4, 6, 8, 10, and 12 mo Duration not specified 1 in person Greater physical activity and energy expenditure (P<0.007) Changes in positive and negative affect predicted change in kilocalories expended (P=0.03)

ACS indicates acute coronary syndrome; C, control; CABG, coronary artery bypass graft; CAD, coronary artery disease; CD, compact disc; CR, cardiac rehabilitation; CVD, cardiovascular disease; F/U, follow-up; GP, general practitioner; I, intervention; MI, myocardial infarction; PCI, percutaneous coronary intervention; PT, physical therapist; RCT, randomized controlled trial; RN, registered nurse; SF36, 36-item Short-Form Health Survey; TPE, therapeutic patient education; and UC, usual care.

Self-management intervention components for the select cardiac populations reflected their high-priority, cardiac disease–specific needs. Symptom management was a common focus of studies for HF and CVD patients to promote the patient’s role in self-management of current symptoms, reduce the ongoing recurrence of symptoms, and enable...
Table 3. TPE for Self-Management: Interventions and Outcomes for AF

<table>
<thead>
<tr>
<th>Study (Year)</th>
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<tbody>
<tr>
<td>Beyth et al51 (2000)</td>
<td>RCT</td>
<td>I=Education in hospital: guidelines on OAC need and bleeding assessment with self-monitoring instruction, F/U coaching</td>
<td>1:1 Inpatient education 3 d before discharge Coaching by lay educator</td>
<td>Weekly for 1 mo Monthly for 6 mo</td>
<td>Major bleeding (GI most common site) at 6 mo was more frequent in usual care group (12% vs 5.6%) Death and recurrent TBE was the same in both groups at 6 mo TTR was significantly higher in intervention group (56% vs 32%; P&lt;0.001)</td>
</tr>
<tr>
<td>Clarkesmith et al52 (2013)</td>
<td>RCT</td>
<td>I=Education for AF patients newly prescribed warfarin; DVD provided; Q&amp;A session</td>
<td>1 Group session 1-h class TTR significantly higher in intervention group (76% vs 71%) at 6 mo (P=0.04) but not at 12 mo Increased knowledge over time (P&lt;0.01), but no differences between groups</td>
<td></td>
<td></td>
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<tr>
<td>Hendriks et al53 (2012)</td>
<td>RCT</td>
<td>I=Nurse-led education related to disease, symptoms, and treatment; evidence-based decision support software</td>
<td>Routine clinic visits with in-depth education</td>
<td>30-min appointment at baseline, 3, 6, and 12 mo and every 6 mo</td>
<td>Intervention group demonstrated improved adherence (P&lt;0.001) and fewer adverse drug events, CV hospitalization (P=0.029), and deaths of CV causes (P=0.025)</td>
</tr>
<tr>
<td>Lane et al54 (2006)</td>
<td>Descriptive, repeated measures</td>
<td>I=Printed booklet and in-person education on AF for all participants</td>
<td>1-on-1 education with print reinforcement</td>
<td>One-time education</td>
<td>Significant improvement in knowledge of INR targets (P=0.001) and factors influencing INR level (P=0.014) No differences in knowledge of bleeding risks</td>
</tr>
<tr>
<td>Mazor et al55 (2007)</td>
<td>RCT</td>
<td>I=1 of 3 videos (OAC narrative, statistical, or both narrative and statistical evidence)</td>
<td>Video education about OAC use</td>
<td>Not specified</td>
<td>No statistically significant differences among groups Improved knowledge about use of OAC in all groups; narrative feedback that video strengthened intervention</td>
</tr>
<tr>
<td>McAlister et al56 (2005)</td>
<td>Cluster RCT</td>
<td>I=Print and audiotape decision aid re: OAC vs ASA</td>
<td>Content tailored to patient’s personal stroke risk</td>
<td>Not specified</td>
<td>Improvement in appropriate OAC care (P=0.03), but effect not sustained at 12 mo Improved but not significant increases in meeting ACCP treatment recommendations and number of patients receiving therapy appropriate to their risk of stroke</td>
</tr>
<tr>
<td>Polek and Hardie57 (2012)</td>
<td>RCT</td>
<td>I=Enhanced education on OAC, delivered by RN</td>
<td>Face-to-face with print 5 F/U phone calls</td>
<td>Total time not reported; 5 phone sessions over 12 wk by RN</td>
<td>Significant improvement of OAC general knowledge (P&lt;0.001) and critical safety OAC knowledge (P&lt;0.001)</td>
</tr>
</tbody>
</table>
symptom recognition associated with new or recurring cardiac-related events. Culturally oriented self-management interventions were specifically addressed, albeit only in a limited number of hypertension studies. Medication management was a common component across the hypertension, AF, and HF cardiac populations. Similarly, diet management for patients with hypertension and HF was integrated into self-management interventions. Given the specific needs of some cardiac populations, shared decision making for AF patients (eg, related to use of OACs) and action planning for CVD patients (eg, action for new or recurrent cardiac symptoms) were self-management interventions implemented to reflect the unique needs of these populations.

**Question 2. What Is the Impact of TPE for Self-Management on Outcomes for Select Cardiovascular Populations?**

**Hypertension Outcomes**

Studies comparing the use of SMBP alone to usual care demonstrated statistically significant changes but few clinically significant improvements in BP. In systematic reviews and meta-analyses, both diastolic and systolic BP readings were statistically improved when SMBP was used; however, BP improvements were not clinically significant. Improvements in BP were often associated with reported increases in hypertensive medication use and other recommended lifestyle behaviors (eg, diet modification, physical activity). Outcomes from an RCT using SMBP did not demonstrate any significant differences in BP over an 8-week study, although medication use (using pill counts) was significantly higher for the treatment group.

In 4 studies, the use of SMBP was integrated with additional behavioral interventions. Significant improvements in BP were noted in all of the studies. Other outcomes associated with self-management interventions for hypertensive patients included significant improvements in hypertension knowledge, medication adherence, self-efficacy for high BP management and depression. Treatment group participants also had an increased titration of hypertensive medications over time to meet target BP goals.

Behavioral interventions in 6 articles did not include the use of SMBP. Findings from these studies demonstrated greater improvements in outcomes than with usual care. Improvements in BP included significant reductions in diastolic BP and systolic BP, as well as improved BP control or BP goal of ≤5 mmHg. One of the studies showed no significant improvements in BP. Both the use of hypertension medications and refill of hypertensive medications were improved.

**Acute CAD Outcomes**

Symptom management is among the key concerns for patients after an acute cardiac event, either to recognize such symptoms of an acute cardiac event in the future or to manage symptoms associated with cardiac conditions. In 2 studies, self-management interventions improved participants’ use of an action plan and help-seeking behaviors to manage symptoms of ACS in the future. A symptom management intervention for CABG patients decreased symptoms, increased physical activity, and significantly improved functioning (physical role, vitality, and mental functioning) over time. Insomnia decreased at 3 to 4 months after a cardiac event among participants in a sleep quality self-management intervention.

After a self-management intervention, PCI patients had improved self-management demonstrated by increased social and role-emotional functioning and significantly improved anxiety symptoms at 6 months after PCI, although there were no significant differences by group for medication adherence. Patients with myocardial infarction in an illness perception–focused intervention had improved self-management (eg, goals for recovery, medication adherence) and a faster rate of return to work than with usual care. Participants also had significant improvements in adoption of lifestyle behaviors to reduce CAD (eg, diet modification, increased exercise, decreased smoking). A positive affect and self-affirmation intervention increased physical activity for PCI patients with computerized decision aid were less likely to start clinically important OAC.
Table 4. TPE for Self-Management: Interventions and Outcomes for Patients With HF

<table>
<thead>
<tr>
<th>Study (Year)</th>
<th>Design</th>
<th>Intervention Components</th>
<th>Delivery</th>
<th>Duration</th>
<th>Intervention Outcomes</th>
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</thead>
<tbody>
<tr>
<td>Agren et al60</td>
<td>RCT</td>
<td>UC vs psychoeducational intervention</td>
<td>1:1 In-person education delivered with printed materials and computer CD-ROM</td>
<td>Three 1-h sessions 2, 6, and 12 wk after discharge</td>
<td>Higher level of perceived control at 3 mo (P=0.05)</td>
</tr>
<tr>
<td>Albert et al61</td>
<td>Randomized</td>
<td>UC vs UC + video</td>
<td>Video for self-learning (HF care and management) at hospital discharge</td>
<td>3 mo</td>
<td>Greater improvement in self-care and fewer symptoms at 3 mo (P=0.01)</td>
</tr>
<tr>
<td>Anderson et al62</td>
<td>N=276</td>
<td>UC=Usual inpatient education</td>
<td>I=Targeted inpatient education with F/U home visit and phone calls</td>
<td>Not specified</td>
<td>Fewer readmissions at 6 mo in intervention group (P=0.01) Total cost savings for intervention group over 6 mo: $67,804</td>
</tr>
<tr>
<td>Arcand et al63</td>
<td>Randomized</td>
<td>C=UC, self-help literature</td>
<td>Two 30–45-min in-person sessions given 4–6 times per week Print material</td>
<td>3 mo</td>
<td>Reduction in dietary sodium intake over 3 mo in intervention group (P&lt;0.05)</td>
</tr>
<tr>
<td>Austin et al64</td>
<td>Randomized</td>
<td>C=UC, 8 wk of monitoring</td>
<td>I=8 wk of CR and group education</td>
<td>24 wk</td>
<td>NS group differences in mortality at 24 wk Fewer hospital admissions (P&lt;0.001) in intervention group at 24 wk Significant improvement in QOL in intervention group at 24 wk Significantly improved NYHA class and 6-min walk test in intervention group at 24 wk (P&lt;0.001)</td>
</tr>
<tr>
<td>Barnason et al65</td>
<td>Experimental</td>
<td>Phone education and counselling sessions</td>
<td>Two 20–30-min phone calls during 2–3-wk period after hospital discharge</td>
<td>3 mo</td>
<td>Improvement in medication adherence, self-efficacy, and QOL over 3 mo (P&lt;0.001)</td>
</tr>
<tr>
<td>Brandon et al66</td>
<td>Experimental</td>
<td>C=UC</td>
<td>Seven 5–30-min phone calls tailored to patient need weekly for 2 wk then every 2 wk for 10 wk</td>
<td>3 mo</td>
<td>Improvement in self-care over 3 mo (P&lt;0.001)</td>
</tr>
<tr>
<td>Caldwell et al67</td>
<td>RCT</td>
<td>C=UC</td>
<td>1:1 In-person education by RN delivered by phone call and printed material</td>
<td>3 mo</td>
<td>Improvement in knowledge (P&lt;0.03) and overall self-care (P&lt;0.01)</td>
</tr>
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Table 4. Continued

<table>
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<tr>
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<tr>
<td>De Souza et al68 (2014)</td>
<td>RCT N=252 I=123 C=129</td>
<td>UC vs home visits and phone call F/U</td>
<td>Four 60-min home visits, in-person verbal instruction, and four 10-min phone calls</td>
<td>4 mo</td>
<td>27% Reduction in composite end point of a first visit to the emergency department, hospital readmission, or all-cause death over 6 mo (P=0.049) Improvement in HF knowledge and self-care in intervention group over 6 mo (P&lt;0.001)</td>
</tr>
<tr>
<td>Delaney and Apostolidis69, 2010</td>
<td>Intervention, pilot N=24 I=12 C=12</td>
<td>C=UC + telemonitoring I=8 Structured nurse education visits using evidence-based protocols designed in previous trials to teach HF self-management and to prevent/reduce depression, as well as telemonitoring</td>
<td>1:1 In-person verbal instruction by RN Use of print materials and phone instruction</td>
<td>90 d</td>
<td>Improvement in QOL (P=0.007) and depressive symptoms (P=0.001) over 90 d</td>
</tr>
<tr>
<td>DeWalt et al70 (2006)</td>
<td>RCT N=123 I=59 C=64 Clinic</td>
<td>C=UC I=Picture-based education and phone calls designed for low health literacy</td>
<td>1:1 In-person verbal instruction by clinical pharmacist or health educator using phone calls and printed educational materials</td>
<td>12 mo</td>
<td>Lower all-cause hospitalization or death in intervention group Improved self-efficacy (P=0.0026), knowledge (P=0.001), and self-care behavior (P=0.001) in intervention group</td>
</tr>
<tr>
<td>DeWalt et al71 (2012)</td>
<td>RCT comparative effectiveness N=605 I=303 C=302 Clinic</td>
<td>UC=Single-session literacy-sensitive training education I=Multisession literacy-sensitive training + F/U</td>
<td>1:1 In-person 40-min verbal instruction by health educator and 5–8 10-min phone calls and printed educational materials</td>
<td>12 mo</td>
<td>NS difference in hospitalization or mortality by group (single session or multisession) Low-literacy subjects in multisession group had fewer HF hospitalizations and mortality (P=0.005) HF-related QOL improved for patients receiving multiple sessions compared with single-session group</td>
</tr>
<tr>
<td>Dracup et al72 (2014)</td>
<td>RCT N=602 C=213 I=203 (Fluidwatchers Lite) I=198 (Fluidwatchers Plus) Clinic or hospital discharged to rural area</td>
<td>C=UC I=Fluidwatchers Lite: face to face and 2 phone calls I=Fluidwatchers Plus: Same as Lite + received phone calls until knowledge was considered known</td>
<td>1:1 In-person verbal instruction using phone calls and printed educational materials focused on self-care</td>
<td>2 y</td>
<td>At 3 and 12 mo, both the Lite and Plus groups had better self-care than the control group (P=0.05)</td>
</tr>
<tr>
<td>Dunbar et al73 (2013)</td>
<td>Randomized N=117 dyads C=53 Patient education=59 Family partnership=58 Clinic and home</td>
<td>UC PFE FPI Verbal instruction by RN and RD focused on dietary sodium and medication adherence Delivered by phone call, small group discussion, print materials, newsletters, DVD PFE: 1-h session at baseline 2-h session at 2 mo, phone call at 4 mo FPI: Identical to PFI with two 2-h small group discussions</td>
<td>PFE: 1-h session at baseline 2-h session at 2 mo, phone call at 4 mo FPI: Identical to PFI with two 2-h small group discussions</td>
<td>8 mo</td>
<td>Dietary sodium decreased from baseline to 4 mo, with both PFE (P=0.04) and FPI (P=0.018) lower than control Adherence to sodium intake was higher at 8 mo in PFE and FPI than in UC (P=0.029)</td>
</tr>
<tr>
<td>Gwadry-Sridhar et al74 (2005)</td>
<td>Randomized N=134 I=68 C=66 Hospital</td>
<td>C=UC I=Multidisciplinary education</td>
<td>Intervention group received 1:1 verbal instruction by nurse and pharmacist using printed materials and video</td>
<td>12 mo</td>
<td>At 12 mo: Improved knowledge (P=0.05) in intervention group</td>
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Table 4. Continued

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<tr>
<td>Heisler et al&lt;sup&gt;75&lt;/sup&gt; (2013)</td>
<td>N=266 I=135 C=133</td>
<td>Group sessions Multicomponent: Weekly peer communication re: HF self-management Optional group sessions for support and behavioral strategies</td>
<td>Verbal instruction in group led by APRN using DVD illustrating peer communication skills and HF self-management</td>
<td>A single 3-h in-person group session Weekly peer partner interaction over 6 mo 3 optional 1.5- h group sessions</td>
<td>NS all-cause rehospitalization or death, QOL, and social support</td>
</tr>
<tr>
<td>Kurtz et al&lt;sup&gt;76&lt;/sup&gt; (2011)</td>
<td>N=132, Stratified into 3 groups: G1=50 G2=56 G3=32</td>
<td>Hospital/home</td>
<td>G1=UC G2=Multidisciplinary education G3=Telephone home monitoring</td>
<td>G2=5-6 in-person consultations for 45 min sessions over 1 y G3=3 Telehealth questions on health, weight, and dyspnea</td>
<td>12 mo Both intervention groups had fewer cardiovascular deaths and hospitalizations for HF over 12 mo Time to readmission for HF was increased in both intervention groups compared with usual care Automated home self-monitoring reduced rehospitalizations in patients with HF</td>
</tr>
<tr>
<td>Lee et al&lt;sup&gt;77&lt;/sup&gt; (2013)</td>
<td>N=44 I=23 C=21 Randomized Hospital/home</td>
<td>Education/counseling + F/U phone calls + symptom diary Multicomponent: Didactic content symptom monitoring and management Self-monitoring of symptoms</td>
<td>1:1 Verbal instruction using phone calls and printed materials Participants logged symptoms in diary</td>
<td>One in-person education session and 5 biweekly phone calls for 3 mo</td>
<td>Longer event-free survival over 3 mo in intervention group (P=0.03) No difference in health-related QOL</td>
</tr>
<tr>
<td>Leventhal et al&lt;sup&gt;78&lt;/sup&gt; (2011)</td>
<td>RCT N=42 I=22 C=20 Hospital/home</td>
<td>C=UC I=Home visit, phone calls, and in-depth education</td>
<td>I=Verbal education at home, 17 phone calls after discharge, and printed materials</td>
<td>12 mo Death: 9% in I vs 20% in C Readmissions ≥1: 45% in I vs 30% in C</td>
<td></td>
</tr>
<tr>
<td>Martensson et al&lt;sup&gt;79&lt;/sup&gt; (2005)</td>
<td>Cluster-randomized N=153 I=78 C=75 Home</td>
<td>C=UC I=Education session and phone calls</td>
<td>I=1 2-h education session and 10 monthly phone calls</td>
<td>12 mo NS differences in QOL and depression at 3 and 12 mo</td>
<td></td>
</tr>
<tr>
<td>Otsu and Moriyama&lt;sup&gt;80&lt;/sup&gt; (2011)</td>
<td>RCT N=102 I=50 C=52 Clinic</td>
<td>C=UC I=6 monthly educational sessions</td>
<td>I=6 30-min in-person education sessions with nurse</td>
<td>12 mo Improvement in QOL Better adherence to sodium-restricted diet, medication administration, exercise, and weight monitoring over 12 mo Lower proportion of patients with dyspnea at 3, 9, and 12 mo</td>
<td></td>
</tr>
<tr>
<td>Paradis et al&lt;sup&gt;81&lt;/sup&gt; (2010)</td>
<td>Randomized N=30 I=15 C=15 Clinic/home</td>
<td>C=UC I=Education/counseling and phone calls with motivational interviewing</td>
<td>1 In-person education session 2 F/U phone calls at 5 and 10 d</td>
<td>30 d Improvement in self-care confidence</td>
<td></td>
</tr>
<tr>
<td>Powell et al&lt;sup&gt;82&lt;/sup&gt; (2010)</td>
<td>N=902 I=Self-management I=Education</td>
<td>Education=HF education alone Self-management= group-based HF education + counseling (18 sessions over 1 y)</td>
<td>Verbal instruction in group session led by health professionals; printed materials and phone calls vs education only</td>
<td>12 mo NS in time to death or HF hospitalization, QOL, and self-efficacy over 1 y</td>
<td></td>
</tr>
</tbody>
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### Table 4. Continued

<table>
<thead>
<tr>
<th>Study (Year)</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Riegel et al (2006)</td>
<td>Mixed methods N=15</td>
<td>Education and counseling with F/U phone call focused on motivation, skill building, and support for self-care</td>
<td>In-person verbal instruction by APRN with 1-6 home visits</td>
<td>3 mo</td>
<td>Improvement in HF knowledge and self-care over 3 mo</td>
</tr>
<tr>
<td>Shearer et al (2007)</td>
<td>Intervention, convenience sample randomly assigned N=90 I=45 C=45</td>
<td>C=Standard HF education I=Standard HF education and empowerment phone calls</td>
<td>1:1 Verbal instruction and 6 phone calls by RN</td>
<td>3 mo</td>
<td>NS difference in functional health or self-management</td>
</tr>
<tr>
<td>Shively et al (2005)</td>
<td>N=116 I=58 C=58</td>
<td>C=UC I=15 wk of education/ counseling sessions and phone calls</td>
<td>Four 2-h in-person group sessions with 3 F/U phone calls and printed materials</td>
<td>16 mo</td>
<td>Higher QOL in physical dimension over 16 mo</td>
</tr>
<tr>
<td>Shively et al (2013)</td>
<td>Randomized N=84 I=43 C=42 Hospital discharge</td>
<td>C=UC I=UC + patient activation</td>
<td>6 Sessions of 1:1 verbal instruction by RN on phone or in person; DVD on self-management</td>
<td>6 mo</td>
<td>Greater improvement in activation (P=0.03) and adherence (P=0.01)</td>
</tr>
<tr>
<td>Sisk et al (2006)</td>
<td>RCT N=406 I=203 C=203 Hospital/home</td>
<td>C=UC I=Education/counseling and coordination of care</td>
<td>1 In-person session Quarterly phone calls</td>
<td>12 mo</td>
<td>Intervention group had fewer readmissions and had improvement in physical functioning and QOL over 12 mo</td>
</tr>
<tr>
<td>Smeulders et al (2010)</td>
<td>RCT N=317 I=186 C=131</td>
<td>C=UC I=UC + 6-wk self-management program</td>
<td>I=Six 2.5-h weekly group sessions, coaching, and printed materials</td>
<td>12 mo</td>
<td>Improvement in cognitive symptom management (P&lt;0.001), self-care behaviors (P=0.008), and cardiac-specific QOL immediately after the intervention not sustained at 6 and 12 mo</td>
</tr>
<tr>
<td>Smith et al (2014)</td>
<td>RCT N=198 I=92 C=106</td>
<td>C=UC that included education, F/U call, and clinic appointment I=UC + multidisciplinary team education and DVD using group appointments</td>
<td>I=4 Weekly in-person educational sessions with booster appointment at 6 mo after start of program and use of 5-part DVD series on HF self-management</td>
<td>12 mo</td>
<td>Fewer first HF-related hospitalizations or deaths over 12 mo Longer time to rehospitalization from 2 to 7 mo in intervention group (P=0.04)</td>
</tr>
<tr>
<td>Stromberg et al (2006)</td>
<td>RCT N=154 I=82 C=72 Clinic</td>
<td>C=UC I=Education using interactive multimedia</td>
<td>I=One 35–45-min session using a CD-ROM</td>
<td>6 mo</td>
<td>Intervention group had increased knowledge of HF at 6 mo (P=0.03)</td>
</tr>
<tr>
<td>Tsuchihashi-Makaya et al (2013)</td>
<td>N=161 I=79 C=82 Home</td>
<td>C=UC I=Home disease management program, including education and counseling sessions and F/U phone calls</td>
<td>4 Biweekly home visits over 2 mo post hospital Monthly calls × 6 mo</td>
<td>12 mo</td>
<td>Intervention group had lower depression (P=0.043) and anxiety (P=0.029) over 12 mo</td>
</tr>
<tr>
<td>Tung et al (2013)</td>
<td>Quasi-experimental N=82 I=42 C=40</td>
<td>C=UC I=Educational sessions and phone calls</td>
<td>Four 1-h sessions twice weekly × 2 wk 6 Phone calls × 2 mo (weekly month 1 and biweekly month 2)</td>
<td>3 mo</td>
<td>Improved self-maintenance at 2 mo (P=0.039)</td>
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<tr>
<td>Wang et al (2011)</td>
<td>N=27 l=14 C=13 Hospital</td>
<td>C=UC l=In-hospital education and postdischarge F/U</td>
<td>1:1 Verbal instruction by multidisciplinary team using phone calls and printed materials 1 postdischarge call 4 monthly home visits after discharge</td>
<td>3 mo</td>
<td>Improvement in QOL (P=0.01), functional status (P=0.01), and symptoms (P=0.01) at 3 mo</td>
</tr>
<tr>
<td>Welsh et al (2013)</td>
<td>Educare and phone call F/U for low-sodium diet</td>
<td>Multicomponent: Didactic content re: low sodium diet Feedback on food diary</td>
<td>1:1 Verbal instruction by multidisciplinary team using phone calls and printed materials Food diary</td>
<td>2 In-person education sessions (duration not reported) + 2 phone calls at 3 and 6 wk (duration not reported)</td>
<td>Better attitude about dietary sodium intake at 6 wk (P&lt;0.01) Lower sodium intake at 6 mo (P&lt;0.01)</td>
</tr>
</tbody>
</table>

APN indicates advanced practice nurse; APRN, advanced practice registered nurse; C, control group; CD-ROM, compact disk–read-only memory; CR, cardiac rehabilitation; DVD, digital versatile disk; FPI, family partnership intervention; F/U, follow-up; G, group; HF, heart failure; HHC, home health care; I, intervention; NS, not significant; NYHA, New York Heart Association; PFE, patient-family education; QOL, quality of life; RCT, randomized controlled trial; RD, registered dietitian; RN, registered nurse; TPE, therapeutic patient education; and UC, usual care.

AF Outcomes

Investigators across all self-management studies reported a common outcome of AF patients’ increased knowledge, although knowledge was measured in many different ways at time points that ranged from 2 weeks to 1 year.51–59 Findings from these studies and others96,99 have demonstrated that at least half of all patients with AF know little about the severity of their disease; stroke risk; the importance of OACs, dietary, or drug interactions; or the normal range of international normalized ratio testing. Retention of educational information has been found to decrease as short a time as 2 weeks,79 and the importance of repeated educational sessions on improvement of long-term outcomes has been demonstrated in some of these studies.51–53 Inclusion of narrative patient stories in education videos significantly increased knowledge and belief about the importance of OACs at the time of education; however, adherence was not assessed.55

Those patients who received education compared with usual care only had significantly fewer bleeding events and higher proportions of therapeutic international normalized ratios when the education was repeated over a 6-month period.54 Improved time in the therapeutic international normalized ratio range was found to be significant at 6 months after a 1-time educational intervention but nonsignificant at 12 months.52 Other researchers55 found that patients who received nurse-led care and repeated education sessions at each office visit over a mean follow-up of 22 months experienced significantly less cardiovascular death (P=0.025) or hospitalization (P=0.029) than the usual care group in cardiologist-led care with shorter office visits.

Both education and decision aids improved adherence to OACs at 3 months.56 Patients who received the decision aid intervention reported improved preparation to make the decision about OAC use and felt more knowledgeable about their illness, treatment options, and benefits and risks of OACs. They also had improved adherence and more realistic expectations of their risk of stroke or bleeding.56,58

HF Outcomes

The effects of TPE interventions, including face-to-face interactions between patients/family and educators and telehealth or multimedia formats, have been investigated, with the length of follow-up ranging from 1 month81 to 2 years72 (Table 4). Patients or families who received educational content multiple times over a reasonable time period appeared to have improved patient self-care behaviors. For example, positive impacts on behaviors were observed in trials that provided a copy of educational videos61 and multiple follow-up telephone interactions alone62,66,69 or in combination with home visits78,83,93 which permitted patients to review educational content and related support to reinforce skills for self-management several times. However, interventions delivered via an interactive CD-ROM failed to show any beneficial effect on self-management behaviors.90

Researchers found that improvement in a patient’s self-management could be achieved in a shorter period of time than improvement in adherence to activities to maintain physiological stability (ie, self-care maintenance).67,92 For example, in the study by Caldwell et al,67 self-care maintenance behaviors (eg, daily weight monitoring) were enhanced at 3 months in the intervention group compared with usual care, but not self-care management behaviors (eg, calling providers when HF symptoms worsened). In 2 studies in which symptom occurrence was measured, patients in the intervention group experienced fewer symptoms than with usual care.61,80 Significant improvement in self-efficacy or perceived control was observed in 1-to-1–based TPE interventions with frequent patient contact70,91 as opposed to interventions provided within a group format.82,88 An intervention designed to improve problem-solving skills in patient and family dyads showed a positive effect on change in perceived control.90

TPE interventions using direct 1-to-1 interactions did not reduce all-cause or cardiac mortality,86,76,87,91 with the exception of a study by Dracup and colleagues72; however, more studies showed a benefit of 1-to-1 TPE interventions.
that decreased rehospitalizations or the composite outcome of death and hospitalizations.68,76,87,91 The group-based TPE interventions were not effective in reducing all-cause death or hospitalization.73,82 Furthermore, TPE interventions might not directly improve clinical indicators of HF, because levels of B-type natriuretic peptide did not improve significantly in some studies that used this biomarker as an outcome to examine the effectiveness of the TPE interventions compared with control groups at 3 and 6 months.67,80

The sustained effect of TPE interventions on health care varied. In one report, 83 patients in the intervention group had a lower hospital readmission rate for 6 months after the nurse-led intervention, and in another report,89 no differences in rehospitalization were observed during a 4-month period after the intervention. Conflicting results might be based on subject characteristics and components of usual care; for example, subjects of one study89 were young (mean age of 59.4 years) and from minority communities.

A subgroup analysis of a study by DeWalt et al13 showed that having adequate literacy (on the part of the patient) and the number of TPE sessions (single versus multiple sessions) were not related to rehospitalization, although among patients with inadequate literacy who received multiple TPE sessions, readmissions were reduced, which highlights the importance of identifying which patients need more intense interventions.

Sustainment of TPE intervention effects varied across studies. TPE interventions delivered by interactive CD-ROM without face-to-face interaction89 did not show a positive effect on quality of life; however, face-to-face interventions led to improved quality of life. Sustained effects of the TPE interventions on quality of life or depressive symptoms were not observed after the interventions ended.79,86 The lack of a sustained effect on these outcomes suggests that additional strategies are needed to maintain the positive effect on psychological status over time. Significant enhancement in functional status and performance was observed when cardiac rehabilitation classes and community-based exercise sessions were used,64 whereas nonsignificant changes in physical and emotional function were found in cases in which the TPE focused on topics of self-management (ie, diet modification, medication use).84,85,87

**Summary of TPE Impact on Outcomes**

In many of the hypertension studies, BP reductions were statistically significant, although the reductions in BP often did not reach clinical significance. The use of team approaches for TPE self-management, for instance, education and peer coaching, did result in overall reductions of BP (≥5 mm Hg reduction) and a significantly lower absolute BP.41 Medication management was the focus across all of the select cardiac populations. Medication use was measured by medication refills and medication adherence; although most studies reported increased medication use, a few studies did not achieve this outcome.

In general, single-component interventions involving education or behavioral counseling alone have had limited effects on self-management outcomes compared with team or multidisciplinary delivery. Those interventions that provided follow-up, either in person or using telehealth delivery, to support sustained self-management had improved outcomes compared with those that only monitored outcomes over time. Across all studies, there were improvements in quality of life, including physiological (eg, physical activity and exercise, return to work, decreased insomnia) and psychosocial functioning (eg, decreased depression and anxiety), and increased self-efficacy for self-care (eg, symptom management, decision making, action planning). Healthcare utilization outcomes reported in HF and AF populations included decreased rehospitalization or emergency care visits and decreased incidence of bleeding associated with OAC use.

**Question 3. How Are Common Barriers to Implementing TPE for Cardiovascular Patients Managed?**

**Health Literacy Barriers**

Health literacy is defined as “the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions.”100(p32) Among patients with cardiac disease, 19% to 61% are reported to have low literacy levels.101–122 One major concern with low literacy can be linked to reduced self-care behaviors in cardiac patients. In addition, low health literacy has been associated with lower BP control and reduced participation in medical decisions.101,111 reduced communication with providers,120 lower disease knowledge,103,104,115 reduced cognition,112 lower medication adherence levels,123 and lower medication refill adherence.108

**Evidence to Address Health Literacy Barriers**

Screening for health literacy is an essential initial step to ascertain the patient’s need for health literacy–adapted TPE. The most commonly used measures of health literacy in cardiac patients include the REALM (Rapid Estimate of Adult Literacy in Medicine)101,102,108,114,124,125 and the S-TOFHLA (Shortened Test of Functional Health Literacy in Adults).9 The S-TOFHLA is a timed measure (7 minutes) that is used to assess literacy in many patient populations. However, delivering such a test in an HF population can yield inaccurate assessments of health literacy given that HF patients are typically older and have more comorbidities than other chronically ill populations, which can affect their speed in completing the assessment. Therefore, Robinson et al118 completed a study with 612 rural community patients with HF to assess whether those with a 7-minute time limit performed the same as those with no time limit. The results indicated that those with no time limit improved by ≥1 literacy level (P<0.01) compared with those with a 7-minute time limit. HF patients could be inappropriately categorized as having inadequate or marginal health literacy because of the time limit; therefore, health literacy measures that are specifically intended for an older population might be warranted. The METER (Medical Term Recognition Test),120 the CAHPS (Consumer Assessment for Healthcare Providers and Systems),107 the NVS (Newest Vital Sign Instrument),116 and the B HLS (Brief Health Literacy Screen)111 have also been used, but there is no

specific literature reported on use among cardiac patients. On the basis of the current evidence, clinicians need to consider psychometric properties of health literacy screening tools (eg, reliability, validity, sensitivity) related to cardiac patient population characteristics.

Although many tools exist to tailor TPE for low health literacy, relatively few have been tested or reported in the cardiac population. Five RCTs were identified in which TPE addressed health literacy. Tailored strategies included (1) the addition of visual aids to educational material, such as video or pictorial aids; (2) repetition of intervention; (3) “teach-to-goal” strategies to confirm learning or understanding; and (4) patient education, therapeutic monitoring, and communication with a primary care provider. One study reported use of literacy-sensitive materials but did not include a description of the strategy or method used. Tailoring interventions to low literacy could improve outcomes. In an RCT among HF patients that compared a basic educational intervention to one with the addition of teach-to-goal education and support programs, people in the teach-to-goal group had greater improvements in knowledge, self-management behaviors, and quality of life. Tailoring TPE to low literacy with the addition of components such as video materials and teach-to-goal strategies could benefit people with both low and high literacy. These findings indicate that universal health literacy precautions in TPE could be beneficial. Two studies reported a positive influence of literacy-tailored interventions, although the influence was modest. In a tailored medication adherence intervention in hypertensive adults, adherence increased by 8%. In a similar intervention among HF patients, medication adherence increased 11% at 9 months; however, there were no significant differences at 12 months. Among patients with HF who received literacy-tailored interventions, there were no improved outcomes between those who received 1 versus multiple education sessions.

Identifying and providing interventions for patients with low health literacy is an important step in developing and delivering effective TPE. Unfortunately, identifying and screening for people with low health literacy is difficult in the time-sensitive healthcare climate. It might be most beneficial in TPE delivery to take universal literacy precautions. More RCTs are needed to understand the causal factors related to the effects of health literacy as a barrier to TPE for cardiovascular patients. However, all patients could benefit from teach-back strategies, the use of pictures and graphics, and more readable materials.

Cognitive Impairment Barriers
Cognitive impairment (CI) is recognized as prevalent in the cardiovascular population and has been linked to a variety of negative outcomes, including rehospitalization, limitations in activities of daily living, and poorer self-care in patients with HF, hypertension, diabetes mellitus, and AF. Memory impairment and deficits in executive functions are barriers to self-management processes that involve tasks and skills (adherence to medications), medical follow-up, and ability to make lifestyle changes (health promotion).

Evidence to Address CI Barriers
Identification of the presence and extent of CI is the first barrier to implementing TPE. There is no recognized standard screening to assess cognitive status specifically in the cardiovascular population. Among multiple assessment tools, the MoCA (Montreal Cognitive Assessment) was deemed useful in identifying CI, and the MMSE (Mini Mental Status Questionnaire) was the most frequently used. Adjusted cutoff scores (<25 for the MoCA and <28 for the MMSE) were recommended to improve sensitivity and specificity in screening HF patients.

Little evidence is available examining strategies to enhance self-management in cardiovascular patients with CI. In focus groups, patients with HF who experienced problems with concentration, attention, and memory reported using pillboxes to manage medications and computers to help improve concentration and memory. Self-management to enhance knowledge in HF patients, delivered via in-hospital education sessions and provided environmental supports (eg, refrigerator cards, pillboxes), resulted in the intervention group (n=63) having significantly higher knowledge scores (P<0.001) than the control group (n=62); however, readmission rates and self-care scores between these groups were not significantly different. In a tailored intervention program (eg, referrals, reminder aides) with a small group of HF patients with CI as determined by the MMSE (n=27), CI was independently associated with readmission and morbidity (P<0.001) regardless of group assignment. This suggests that in spite of receiving additional interventions, those patients with CI continued to experience negative outcomes.

Limited evidence is available to guide clinicians in the implementation of TPE in patients with CI. Instruments available for CI assessment need further testing to identify sensitive, specific cutoff scores for classification purposes. The majority of studies related to CI among HF, AF, hypertension, and CAD populations were descriptive and used small convenience samples in single sites. Interventions used to address CI often included cuing processes such as reminders and environmental supports (eg, refrigerator cards, pillboxes). Studies show promise but need wider testing.

Time Barriers
Time requirements for delivering TPE to patients and their families are dependent on multiple variables, such as readiness to learn, amount of information, and cognitive status. On the basis of the current research, several studies have addressed the amount of time required to effectively teach patients; however, the studies have all been focused on patients with HF. In an RCT, Krumholz et al used an hour-long face-to-face education session taught by an experienced cardiac nurse educator within 2 weeks of hospital discharge. Telephone surveillance calls were completed on a scheduled basis to review understanding of the information taught during the session. The intervention group had significantly fewer hospital readmissions. In addition, Koelling et al examined a 1-hour face-to-face HF education session taught by a nurse educator at the time of discharge. Content
was similar to the study by Krumholz et al.,\textsuperscript{148} and the intervention group had significantly fewer readmission days and deaths, along with better compliance with self-management behaviors. Clark et al.\textsuperscript{150} studied the effect of eight 1- to 1.5-hour education sessions delivered in the home by advanced practice nurses over a 3-month period, combined with written education and follow-up phone calls, on health status and self-management outcomes. The intervention group showed significant improvements in functional status, HF knowledge and self-management, quality of life, memory, and self-efficacy.

Although this evidence supports 1 hour of HF discharge education, there were reported barriers to providing patients with this amount of education.\textsuperscript{151} In a survey of 409 members of the American Association of Heart Failure Nurses, 45.5\% reported that patients never or rarely received 1 hour of discharge education. Reasons for not meeting this goal included lack of time, low patient literacy, lack of interest from patient/family, lack of management support, and difficulty of documentation in electronic medical records. Those institutions that participated in Magnet Designation, Heart Failure Program Accreditation, or Get With The Guidelines had higher reported rates of providing 1 hour of HF discharge education.

One solution to this time-related barrier for TPE is the implementation of team-based care using the transitional care model.\textsuperscript{152} Studies have reported that implementing a multidisciplinary team approach provides continuity of care from hospital to home to clinic and can improve the functional status of the patient, quality of life, and medication optimization, as well as reducing hospital readmissions.\textsuperscript{153–157}

**Discussion**

This review of the evidence elucidates the impact of TPE interventions for self-management by patients with CVD. Positive effects of self-management TPE for CVD patients were apparent in many of the studies; however, similar to other studies,\textsuperscript{4,13,156–161} precise or standard descriptions of the TPE components were often limited, which made it difficult to

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<tr>
<th>Table 5. Self-Management TPE Recommendations for Clinical Practice</th>
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<td><strong>Considerations for Implementation of Recommendations Into Clinical Practice</strong></td>
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<tr>
<td><strong>Recommendations</strong></td>
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<tr>
<td>1. Multiple modes of TPE delivery (face-to-face, telephone, telehealth, and combinations of modalities) are useful for delivery and monitoring of self-management interventions designed for CVD populations.</td>
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<td>2. A team-based approach to TPE for self-management can be useful to provide consistent messaging to the patient by the healthcare team.</td>
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<td>3. TPE interventions for self-management focused on activating patients’ self-care behaviors are preferred to information-only interventions.</td>
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<td>4. Integration of self-management interventions into CR is recommended to fill unmet gaps in TPE needs of CVD patients.</td>
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<td>5. Use of comprehensive TPE interventions that address self-management processes might be more effective in adopting self-care behaviors.</td>
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<td>6. Measurement of outcomes that reflect a more comprehensive evaluation of patients’ self-management is warranted.</td>
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<td>7. Health literacy assessment and interventions are indicated to tailor effective TPE self-management strategies for CVD patient populations.</td>
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<tr>
<td>8. Assessment of patient cognition is indicated to tailor effective TPE self-management strategies for CVD patient populations.</td>
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<tr>
<td>9. Incorporate TPE for self-management into workflow processes to increase effectiveness and time efficiency.</td>
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</table>

CR indicates cardiac rehabilitation; CVD, cardiovascular disease; MoCA, Montreal Cognitive Assessment; REALM, Rapid Estimate of Adult Literacy in Medicine; S-TOFHLA, Shortened Test of Functional Health Literacy in Adults; and TPE, therapeutic patient education.
thoroughly determine the interrelationships between the TPE components and aspects of self-management targeted. Generally, the studies reviewed did report the overall techniques, length, and duration of TPE sessions, although the theories underlying the intervention mechanism for TPE were often missing. Most TPE self-management interventions were delivered by nurses and frequently comprised individual sessions with the patient. Many approaches to TPE were time-consuming and resource intensive, especially when follow-up over time was needed to support cardiac patients’ self-management. Furthermore, it is unclear whether or not there are dose-response relationships between the amount of information, reinforcement and support for learning, and patient outcomes, particularly in special populations, including minority groups, for whom language or cultural sensitivity might influence the adoption of self-management behaviors, or for those who have disabilities that may require accommodations to facilitate learning. All of the studies emphasized the relevance of TPE for patients with CVD. The intensity and duration of the TPE interventions were variable, which might have affected the overall impact or efficacy of the various interventions across the CVD populations.

Study Limitations

Despite an extensive electronic and hand search, eligible studies might have been missed because of inconsistent terminology used in TPE and self-management research. Furthermore, currently available published studies had methodological limitations that might have had an impact on the reported outcomes of the self-management interventions.

Conclusions

In summary, variables affecting TPE related to practice settings and actual implementation of self-management interventions, such as the number and type of staff involved and the availability of various types of educational materials, as well as how they are deployed, are often not consistently described or measured for CVD populations. Furthermore, the overall generalizability of findings and generalizability by patient population were hampered by methodological threats to internal validity and the variability of intervention actions, delivery methods, delivery personnel, length of follow-up, and other factors. It is of particular note that none of the studies addressed the cost of implementing TPE, which is a critical issue to be considered in the adoption and use of TPE. Evidence from published interventions has been synthesized to derive recommendations for self-management TPE and considerations for implementing these recommendations, as summarized in Table 5. These recommendations delineate implications for clinical practice and areas for future research to use TPE to improve outcomes for cardiovascular patients.

Disclosures

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Evidence for Therapeutic Patient Education Interventions to Promote Cardiovascular Patient Self-Management: A Scientific Statement for Healthcare Professionals From the American Heart Association

Susan Barnason, Connie White-Williams, Laura P. Rossi, Mae Centeno, Deborah L. Crabbe, Kyoung Suk Lee, Nancy McCabe, Julie Nauser, Paula Schulz, Kelly Stamp and Kathryn Wood on behalf of the American Heart Association Council on Cardiovascular and Stroke Nursing; Council on Cardiovascular Disease in the Young; Council on Clinical Cardiology; and Stroke Council

Circ Cardiovasc Qual Outcomes. 2017;10:
doi: 10.1161/HCQ.0000000000000025

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