

Patient Preferences for Cardiac Rehabilitation – A Systematic Review

Yunyue Liu^{1,*}, Mengyu Su^{1,*}, Yang Lei¹, Jinping Tian^{1,2}, Leng Xue¹, Lin Zhang¹

¹School of Nursing, Nanjing Medical University, Nanjing, Jiangsu Province, People's Republic of China; ²Department of Cardiology, the First Affiliated Hospital with Nanjing Medical University, Nanjing, Jiangsu Province, People's Republic of China

*These authors contributed equally to this work

Correspondence: Yang Lei, School of Nursing, Nanjing Medical University, No. 101, Longmian Avenue, Jiangning District, Nanjing, Jiangsu Province, People's Republic of China, Tel +86 19955062997, Fax +86 258 6869 555, Email nursleyang@njmu.edu.cn; Jinping Tian, The First Affiliated Hospital with Nanjing Medical University, No. 300, Guangzhou Road, Gulou District, Nanjing, Jiangsu Province, People's Republic of China, Tel +86 13851550156, Fax +86 519 6809 1881, Email tianjp6@163.com



Background: Although a large number of studies have demonstrated the effectiveness of cardiac rehabilitation (CR), patient preferences for CR remain unclear. Knowing patient preferences may contribute to increasing patient participation and adherence, thus improving patient prognosis.

Methods: A systematic search was carried out using electronic databases and manual reference checks from inception until 15th June 2022. Quantitative studies, qualitative studies and mixed methods studies assessing patient preferences for CR were included. Two researchers independently conducted study selection and data extraction. CR preferences were divided into three categories: CR settings, CR components, and CR contents. A narrative synthesis was applied to integrate the results of the included studies. The Mixed Methods Appraisal Tool (MMAT) was used to assess the quality of included studies.

Results: Ultimately, 17 publications were included in this study. Regarding CR settings, most patients preferred the hospital to home, some considered both, and a few were willing to accept the local CR club as an alternative setting to the hospital. For CR components, regardless of age and gender, patients considered exercise training and nutrition counseling to be the most important and smoking cessation to be the least important. In exercise intervention of CR contents, progress discussion and encouragement were rated as most critical, and non-conflicting with other activities was rated as least critical. In psychological intervention of CR contents, most patients were willing to accept psychological intervention, and a few patients wanted to heal the trauma with the passage of time.

Conclusion: This systematic review provides important insights into patient preferences for CR, clarifying patient preferences for CR settings, components, and contents, along with possible influencing factors. Patient preferences may change due to the COVID-19 epidemic, and there is still a need to focus on patient preferences for CR and conduct more relevant primary research to validate the findings of this paper in the future.

Keywords: cardiac rehabilitation, patient preference, systematic review, COVID-19

Introduction

Cardiovascular disease (CVD) has become the leading cause of mortality and fundamental cause of disability worldwide, not only causing chest pain and shortness of breath, reducing health-related quality of life, but also imposing a substantial financial burden on healthcare systems.¹⁻³ Cardiac rehabilitation (CR), aimed at reducing cardiovascular risk, mortality and readmission rates, improving prognosis and reducing the economic burden, is therefore essential.⁴ Previously, patients often underwent CR in hospital, however, due to the COVID-19 pandemic, many hospitals have suspended their CR programs in order to curb the spread of the virus.⁵ Remote CR, benefiting from rapid advances in information and communication technology, can provide adequate guidance and expert advice to CVD population during the COVID-19 outbreak.⁶ Equipped with remote CR technology, home

CR may act as a suitable alternative to hospital CR.⁷ Compared to hospital CR, home CR overcomes barriers such as long distances to CR facilities, financial costs, and conflicting work schedules.⁸ In addition, technology-assisted home CR can extend healthcare support to more patients, and patients from rural areas have more access to CR.⁹

Despite many proven benefits, CR currently suffers from low participation and adherence due to a mismatch between patients and CR programs that does not take into account patient preferences.^{10,11} In addition, a wide range of CR settings, components, and contents are available for patients. For example, exercise-based CR includes hospital-based CR and home-based CR, with different contents such as various exercise frequency, intensity, time, and form, thus resulting in different risks and benefits.¹² However, in practice, CR programs are often dominated by the health care providers, patient preferences are not well understood and need further exploration.^{13,14} Health care professionals are recommended to take greater account of patient preferences and make greater efforts to involve them in the decision-making process, when they develop individualized CR programs for their patients.¹⁵

Inherent in patient preference is the relative desirability of different attributes to patients and the trade-off between pros and cons when faced with multiple choices.¹⁶ The inclusion of patient preferences in medical research has become a recognized approach to promoting patient-centered care, and its use has increased significantly.¹⁷ Patient preferences can be described in several ways, including quantitative (eg, discrete choice experiments, best-worst scaling, adaptive conjoint analysis) and qualitative research methods (eg, focus groups, semi-structured interviews, in-depth interviews).¹⁸ Combining these research methods allows us to gain a more comprehensive understanding of patient preferences for CR. Healthcare professionals who consider patient preferences when designing CR programs can be beneficial in improving patient participation and adherence to CR, thereby improving CR effects and patient prognosis.

Previous studies have provided limited insight into patient preferences, and systematic reviews that integrated patient preferences for CR are currently lacking. Therefore, we conducted a systematic review to systematically summarize the evidence related to patient preferences for CR and its related factors, theoretically bridging the limitations of previous studies.

Methods

The findings of this systematic review are presented in accordance with the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement.¹⁹ This systematic review was registered on the International Prospective Register of Systematic Reviews (PROSPERO [CRD42020184232]).

Search Strategy

The Cochrane Central Register of Controlled Trials (CENTRAL), PubMed, Web of Science, Embase, CINAHL, China National Knowledge Infrastructure (CNKI), and WANFANG databases were systematically searched from their inception until 15th June 2022. Search terms incorporated MeSH terms and keywords related to “cardiac rehabilitation” in combination with “patient preference” “patient choice” “stated preference”. A detailed search strategy is displayed in [Supplementary Table 1](#). Open Grey was used to search the grey literature. We also manually searched the reference lists of all eligible articles and relevant reviews for additional studies that were not identified by the search strategy.

Eligibility Criteria

Studies were included if they (1) targeted at patients with CVD requiring CR or healthy people with assumed CR needs; (2) assessed patient preferences for CR; (3) published in English or Chinese. Studies were excluded if they (1) only assessed economic evaluation or willingness to pay for CR, patient satisfaction with CR or adherence to CR; (2) were duplicate studies or contained no original data, such as reviews, editorial, opinion articles, letters, preclinical studies, and conference papers.

Study Selection

All the retrieved records were imported into EndNote (version 20.0) to remove duplicates. Two researchers (LYY and SMY) independently screened study titles and abstracts for eligibility. Full-text articles of potentially relevant abstracts

were independently retrieved and assessed for inclusion by two researchers (LYY and SMY). Authors of the respective articles were contacted through email with additional information requests if the information was incomplete. Any disparities in study selection would be resolved by discussion and consulting a third reviewer (XL) to reach a consensus.

Data Extraction and Analysis

Two researchers (LYY and SMY) independently extracted data from each article that met the inclusion criteria, including study characteristics (author, year, country), study objectives, study population (patient source, sample size, age, gender), methods of assessing preferences, study design and patient preferences. To categorize these heterogeneous studies, we referred to the assessment categories for CR recommended by the European Association for Preventive Cardiology which take CR components and CR contents as two separate categories.²⁰ CR components refer to the core components of CR. CR contents refer to what the patients prefer to do for a particular component, and in the case of exercise component, its contents include timing, form, and duration of exercise. We also included CR settings as one of the categories. This has been especially important during social distancing restrictions associated with COVID-19. Patient preferences for CR were eventually grouped into three main categories: CR settings, CR components, and CR contents. Disagreements were resolved through adjudication with a third researcher (XL).

Due to the heterogeneity and mostly observational design of the eligible studies, we did not statistically integrate results in a meta-analysis but conducted an in-depth narrative synthesis to clarify patient preferences for CR.

Quality Assessment

Mixed Methods Appraisal Tool (MMAT) was used to assess the quality of multiple included studies.²¹ MMAT can evaluate the methodological quality of 5 types of studies: qualitative studies, randomized controlled trials, non-randomized studies, quantitative descriptive studies, and mixed methods studies. The 2018 version has five separate evaluation entries for each type of study, except for mixed studies, which have 15 evaluation entries. A total score is up to 5 points, with 1 point for meeting the standard and 0 points for not. Two investigators (LYY and SMY) conducted the quality evaluation independently, and any disagreements were resolved in consultation with a third investigator (ZL).

Results

Studies Selection

In total, 4384 publications were identified, and 4014 publications remained after removing duplicates. Fifty-three articles were retrieved for further full-text screening, and 17 of these articles met the eligibility criteria. In addition, a manual search of reference lists of eligible publications did not reveal additional publications for inclusion. Ultimately, a total of 17 publications were included in the final review.^{16,18,22–36} Figure 1 depicts the PRISMA flow chart of literature screening and selection.

Study Characteristics

Seventeen included studies were all published from 1996 to 2021. The sample size ranged from 16 to 512. Most of the studies were published in the UK ($n = 5$). Seven different assessment methods were used: rating, discrete choice experiment, questionnaire, count analysis, semi-structured interview, in-depth interview, and focus group. The study characteristics are shown in Table 1. Patient preferences for CR were classified into three categories based on the criteria, but due to insufficient original literature, the focus was mainly on exercise and psychological intervention of CR contents. The categories of CR preferences were as follows: (1) CR settings; (2) CR components; and (3) CR contents, including exercise intervention and psychological intervention. Patient preferences for CR are shown in Table 2.

Quality Assessment

According to the quality evaluation criteria of MMAT, all included studies scored three or higher, with high quality. Quantitative descriptive studies were biased in sampling strategy and statistical analysis methods, randomized controlled

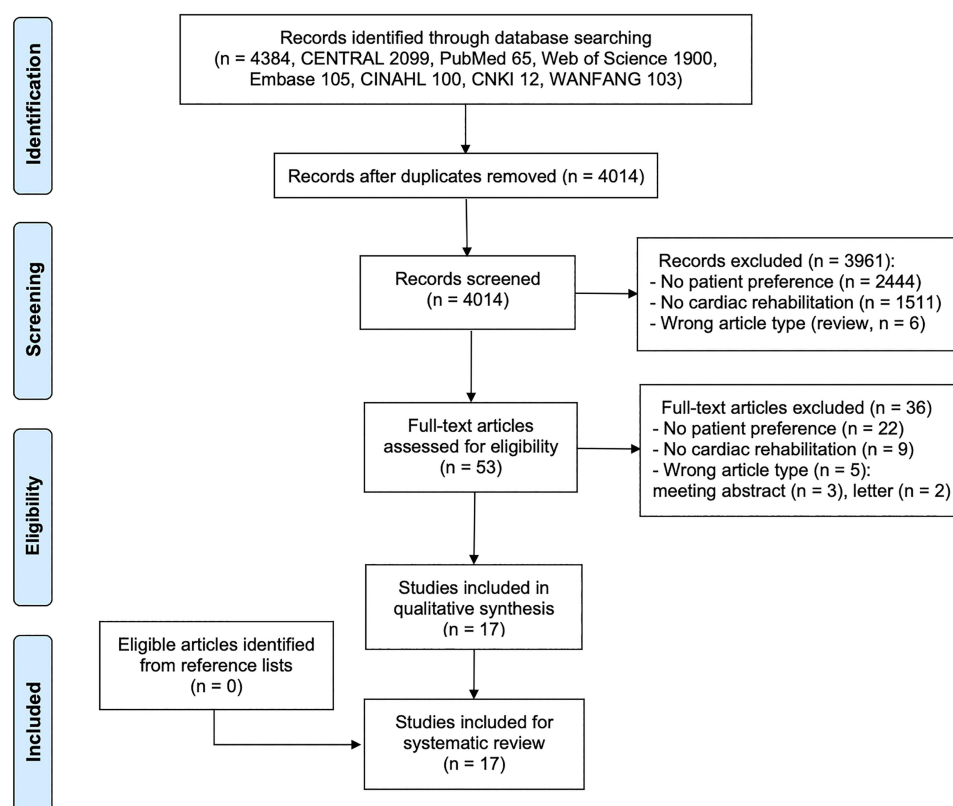


Figure 1 The PRISMA flow chart of literature screening and selection process.

Notes: PRISMA figure adapted 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. doi: 10.1136/bmj.n71. Creative Commons.

trials were biased in randomization, blinding, and participant compliance, qualitative studies were biased in qualitative approaches, and mixed methods studies were biased in inconsistencies. The quality assessment results are shown in Table 3.

Patient Preference for CR Settings

Eight studies described patient preferences for CR settings, including hospital, home, and local CR clubs. Patient preferences for CR settings varied, with most patients preferring hospital CR over home CR,^{32,35} some patients considering both,²⁹ and a few patients willing to accept local CR clubs as an alternative to hospital CR.²⁷ People with different demographic characteristics had different preferences for CR settings. Older patients (≥ 65 years) preferred home CR, and younger patients preferred local CR clubs.²³ Factors influencing patient preferences for CR settings were travel time, distance, facilities, and trained staff.^{18,25} Patients who chose hospital CR were more concerned with peer discussion and exercise supervision, while those who chose home CR were more concerned with independent exercise and flexible scheduling.^{16,32}

Patient Preference for CR Components

Two studies described patient preferences for CR components. Regardless of age and gender, patients considered exercise training and nutrition counseling to be the most important CR components, and smoking cessation to be the least important.^{23,26} Specifically, patient preferences for CR components were slightly different among patients with different characteristics. Younger patients emphasized stress management, vocational counseling, and smoking cessation more than older patients.²³ Female patients valued personal education and exercise training equally, while male patients highly preferred personal education.²⁶

Table I Study Characteristics for Included Studies

Study	Country	Objectives	Population			Method	Study Design
			Sample Size	Mean Age	Gender		
Moore et al 1996 ²²	USA	Compare exercise preferences in CR by age	Recruited from a CR program (n=65)	66±9.6 years	Female: 49.2%	Rate 17 CR features on a scale from 0 to 4	Cross-sectional study
Filip et al 1999 ²³	USA	Evaluate preferences in CR setting and components by gender and age	University of Michigan Medical Center with acute myocardial infarction patients (n=199)	Male: 60.0±11.6 years female: 63.7 ±12.7 years	Female: 31.7%	Rate 6 CR setting and components on a scale from 1 to 10	Cross-sectional study
Ruland et al 2001 ²⁴	Norway	Elicit female preferences for exercise feature in CR	Total: 16 recruited from a CR program (n=8) healthy volunteers (n=8)	Patients: 69 years volunteers: 39 years	Patients: female: 100% volunteers: female: 100%	Rate 20 CR features on a scale from 0 to 10	Cross-sectional study
Grace et al 2005 ²⁵	Canada	Compare patient preferences for home-based versus hospital-based CR programs	Recruited from a CR program (n=80)	61.1±10.83 years	Female: 36.3%	Rate 14 CR features on a scale from 1 to 5	Cross-sectional study
Kjaer et al 2006 ²⁶	Denmark	Analyze preferences for CR components	Recruited from three CR programs (n=512)	Not reported	Not reported	DCE: 5 attributes and 10 levels rate 4 CR questions	Cross-sectional study
Wingham et al 2006 ¹⁶	UK	Identify preferences for hospital or home-based CR	Myocardial infarction patients in Royal Cornwall Hospital (n=17)	67 years	Female: 17.6%	Semi-structured interview	Semi-structured interview
Angelis et al 2008 ²⁷	Australia	Explore preferred alternatives to hospital-based programs	Recruited from six CR programs (n=97)	66.6 years	Female: 28%	Questionnaire focus group	Mixed method research
Madden et al 2011 ¹⁸	UK	Identify preferences for hospital or home-based CR	Patients from five sites across England (n=35)	Male: 59 years female: 55 years	Female: 17%	Semi-structured interview	Semi-structured interview
Andraos et al 2015 ²⁸	Canada	Elicit patient preferences for exercise feature in CR	Recruited patients from six inpatient and out-patient cardiac settings (n=105)	Not reported	Not Reported	Rate 15 CR features on a scale from 1 to 5	Randomized controlled trial

(Continued)

Table 1 (Continued).

Study	Country	Objectives	Population			Method	Study Design
			Sample Size	Mean Age	Gender		
Tang et al 2017 ²⁹	Denmark	Evaluate preferences in CR setting for exercise intervention	Patients who underwent either radio-frequency ablation for atrial fibrillation, or heart valve surgery (n=158)	Center-based: 62 ±10.3 years home-based: 58.9±9.8 years	Female: 25.3%	Questionnaire (1 item)	Randomized controlled trial
Turner et al 2017 ³⁰	UK	Elicit preferences for psychological intervention in CR	Recruited patients from twenty CR teams (n=18)	67 years	Female: 55.6%	In-depth interview	In-depth interview
Chia S et al 2018 ³¹	Singapore	Elicit preferences for exercise feature in CR	Recruited patients from two community-based CR centers (n=265)	65.7±8.8 years	Female: 39.2%	Count analysis of 9 paired choices	Cross-sectional study
Boyde et al 2018 ³²	Australia	Elicit preferences for setting and exercise feature in CR	Recruited patients from a CR program (n=200)	Not reported	Female: 21.5%	Rate three items on a scale from 1 to 10 DCE: 5 attributes and 15 levels	Cross-sectional study
McPhillips et al 2019 ³³	UK	Elicit preferences for psychological intervention in CR	Recruited patients from three CR programs (n=46)	Not reported	Not reported	Semi-structured interview	Semi-structured interview
Van Egmond-Van et al 2021 ³⁴	Netherlands	Explore preferences for exercise in CR	Undergone surgery for congenital heart disease at the age of 4–16 years (n=45)	12.2 years	Female: 60%	Rate 4 CR items	Cross-sectional study
Scherrenberg et al 2021 ³⁵	Belgium	Evaluate preferences in CR setting	Recruited patients from a CR program (n=55)	65.4±10.5 years	Female: 37%	Electronic questionnaire (7 CR items)	Prospective single-centre study
Shields et al 2021 ³⁶	UK	Elicit preferences for psychological intervention in CR	Adults eligible for CR and have clinically significant symptoms of anxiety and/or depression (n=35)	59±7 years	Female: 37.1%	DCE: 5 attributes and 20 levels questionnaire (1 additional item)	Cross-sectional study

Abbreviations: CR, cardiac rehabilitation; DCE, discrete choice experiment.

Table 2 Patient Preferences for CR in Included Studies

Category	Study	Preferences
CR setting	Filip et al 1999 ²³	Preferences differed in CR setting by age, not by gender. Both male and female patients considered home-based program to be the least important. Older patients (≥ 65 years) preferred home-based CR, younger patients (< 65 years) preferred local health club.
	Grace et al 2005 ²⁵	Factors influencing patient preference: travel time or distance, exercise monitoring, health benefits, social nature of program and available facilities.
	Wingham et al 2006 ¹⁶	They expected to change lifestyle, receive specific guidance and support from experts. The hospital-based group preferred exercise supervision and group camaraderie. They were willing to arrange travel plans and thought they lacked self-regulation. The home-based group preferred CR adapting to life and expressed transport concerns. They considered themselves self-disciplined and disliked groups.
	Angelis et al 2008 ²⁷	38% patients were interested in other CR models compared to hospital-based CR, with local programs (ie, closer to home, home visits by CR professionals, use of a CR brochure, and telephone contact or a combination of the above) being the most attractive options.
	Madden et al 2011 ¹⁸	Choosing home-based CR was often based on limitations rather than positive choices. Constraints include lack of information, inadequate referral systems and trained staff, restricted time options, geographic location of CR services and restrictive socioeconomic factors.
	Tang et al 2017 ²⁹	Patient preference for home-based and center-based CR exercise programs appeared to be comparable.
	Boyde et al 2018 ³²	Most patients preferred centre-based rather than home-based CR. Factors in choosing centre-based CR: convenience, motivation, lack of technology, social situation and experts contact. Factors in choosing home-based CR: convenience, independence, work commitments, transportation issues, flexibility and dislike of social groups.
	Scherrenberg et al 2021 ³⁵	Most patients thought remote CR was an option in combination with center-based CR, with few patients preferred remote CR. Most patients felt supported and satisfied with remote CR sessions during COVID-19, and were willing to pay for it. The main advantages of remote CR were time saving and lack of transport; the main disadvantages were less monitored, less insight in clinical condition and no social contact.
CR components	Filip et al 1999 ²³	Preferences differed in CR components by age, not by gender. Both male and female patients considered exercise training and nutritional counseling to be the most important components. Younger patients rated the following significantly higher than older patients: stress management, vocational counseling and smoking cessation.
	Kjaer et al 2006 ²⁶	Total preference: rated personal patient education, exercise training and nutritional counseling as most important, group patient education and smoking cessation as less important. Preferences differed with gender. Female preferred personal patient education and exercise training equally while male highly valued personal patient education.

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Table 2 (Continued).

Category	Study	Preferences
CR contents- exercise intervention	Moore et al 1996 ²²	Preferences were similar of male and female patients. Both male and female patients indicated that progress discussion and encouragement from professionals were highly important, convenience factors, such as transportation, drive time and non-conflicting with other activities were less important.
	Ruland et al 2001 ²⁴	Preferences differed by characteristics of health conditions among female patients. Female patients preferred flexible hours, encouragement from family/friends and support from physician while female volunteers valued not having chest pain, non-conflicting with other activities and drive time.
	Andraos et al 2015 ²⁸	Women-only group: preferred individualized attention, encouragement from experts and problems discussion. Mixed-sex group: preferred progress discussion, encouragement from experts and problems discussion. Home-based group: preferred progress discussion, goal setting and encouragement from experts.
	Chia S et al 2018 ³¹	Most patients (85.2%) preferred CR with new group activities, support group, cash incentives, deposit and self-funded cost, few exercise equipment with physiotherapist without monitoring equipment.
	Boyde et al 2018 ³²	Most patients preferred CR that started within two weeks after discharge, exercised in a single gender group and delivered information one-on-one by health professionals. Most patients preferred CR that started within two weeks after discharge, exercised in a group and delivered information one-on-one by health professionals. Patients disliked exercise using telehealth and information delivery by smart phone Apps. Program length and program time did not affect patient choice. Program length and program time did not affect patient choice.
	Van Egmond-Van et al 2021 ³⁴	They preferred information about specific home exercises, paper or verbal information from pediatric physical therapist and face- to-face monitoring.
CR contents- psychological intervention	Turner et al 2017 ³⁰	Some patients preferred to have psychological intervention earlier, whether in or out of the hospital. Some patients also thought psychological support should be continued beyond CR if it was still needed.
	McPhillips et al 2019 ³³	Distressed CR patients had a variety of concerns but were generally reluctant to discuss them, so they pinned their hopes on the passage of time. Due to face validity, patients preferred to address concerns without sharing the content.
	Shields et al 2021 ³⁶	Patients preferred to receive any form of psychological treatment rather no treatment at all. Patients preferred to receive overview by experts before therapy and lower cost. Program time, method and format did not affect patient preference. Patients preferred psychotherapy at home to CR center, but this was not significant.

Abbreviations: CR, cardiac rehabilitation; COVID-19, Corona Virus Disease 2019.

Table 3 Quality Assessment Results of Included Studies

Study Design	Study	Q1	Q2	Q3	Q4	Q5	MMAT Score
		Sampling Strategy	Sample Representative	Measurements	Nonresponse	Statistical Analysis	
Quantitative descriptive	Moore et al 1996 ²²	Yes	Yes	Yes	Yes	No	4****
	Filip et al 1999 ²³	No	Yes	Yes	Yes	Yes	4****
	Ruland et al 2001 ²⁴	Yes	Yes	Yes	Yes	Yes	5*****
	Grace et al 2005 ²⁵	Yes	Yes	Yes	Yes	Yes	5*****
	Kjaer et al 2006 ²⁶	No	Yes	Yes	Yes	Yes	4****
	Chia S et al 2018 ³¹	Yes	Yes	Yes	Yes	Yes	5*****
	Boyde et al 2018 ³²	No	Yes	Yes	Yes	Yes	4****
	Van Egmond-Van et al 2021 ³⁴	No	Yes	Yes	Yes	Yes	4****
	Scherrenberg et al 2021 ³⁵	No	Yes	Yes	Yes	No	3***
	Shields et al 2021 ³⁶	No	Yes	Yes	Yes	Yes	4****
		Randomization	Baseline	Outcome data	Blinding	Participants adherence	
Quantitative randomized controlled trials	Andraos et al 2015 ²⁸	Yes	Yes	Yes	No	No	3***
	Tang et al 2017 ²⁹	No	Yes	Yes	No	Yes	3***
		Qualitative approach	Data collection	Findings	Interpretation	Coherence	
Qualitative	Wingham et al 2006 ¹⁶	Yes	Yes	Yes	Yes	Yes	5*****
	Madden et al 2011 ¹⁸	No	Yes	Yes	Yes	Yes	4****
	Turner et al 2017 ³⁰	No	Yes	Yes	Yes	Yes	4****
	McPhillips et al 2019 ³³	Yes	Yes	Yes	Yes	Yes	5*****
		Rationale	Content Integration	Results Integration	Inconsistency resolution	Quality criteria	
Mixed methods	Angelis et al 2008 ²⁷	Yes	Yes	Yes	No	Yes	4****

Note: MMAT quality assessment categories range from 1* (lowest) to 5***** (highest).

Abbreviation: MMAT, mixed methods appraisal tool.

Patient Preference for CR Contents

Six studies described patient preferences for exercise intervention in CR contents. Regardless of gender, patients rated discussing progress and encouragement from experts as highly important, while non-conflicting with other activities as less important.^{22,28} Female patients focused more on individualized attention compared to male patients.²⁸ Preferences differed by characteristics of health conditions that female patients preferred flexible hours, encouragement from family/friends and physician support while female health volunteers attached importance to no chest pain, non-conflicting with other activities and driving time.²⁴ About the timing of exercise intervention, most patients preferred to start within two weeks after discharge.³² In addition, patients preferred to exercise in a group and receive information from health professionals.^{31,32,34} They disliked exercise using telehealth and information obtained by smartphone Apps.³² Length and time of exercise intervention did not affect patient choice.³²

Three studies described patient preferences for psychological intervention in CR contents. Compared with no psychological therapy, most patients preferred to receive any form of psychological intervention.³⁶ However, some distressed patients were reluctant to discuss their psychological problems, hoping that time would heal the psychological wounds.³³ Some patients preferred to have psychological intervention earlier, either in hospital or discharge, even beyond CR, if it was still needed.³⁰ As for the location of psychological intervention, patients preferred to receive psychological treatment at home compared to hospital.³⁶ Due to the protection of personal privacy, some patients preferred to address psychological worries but without describing the distress.³³ Specifically, patients preferred to receive a briefing before psychological treatment, and costs were lower. Furthermore, time, method, and format of psychological intervention did not affect patient choice.³⁶

Discussion

This systematic review included 17 papers summarizing patient preferences for CR and categorized by CR settings, components, and contents. This review summarizes patient preference for CR and the related influencing factors.

Previous studies have shown no significant differences between home-based and hospital-based CR in terms of functional capacity, psychological symptoms, quality of life, and all-cause hospitalization.^{7,9} In addition, a recent systematic review has shown that home CR can be a safe alternative to CR.³⁷ Despite this, most patients prefer hospital-based compared with home-based CR.^{32,35} Exploring the reasons, patients choose hospital-based CR primarily due to the constraints of time, location, facility, and inadequate healthcare system, rather than the active selection.^{18,25} Compared with younger patients, older patients preferred home-based CR.²³ Home-based CR, which integrates interventions into everyday life, was more effective for older patients, who are hindered by inaccessible locations, limited transportation, and comorbid conditions to attend hospital-based CR.³⁸ Although patients currently prefer hospital-based CR, patient preferences may shift in the future. The recent COVID-19 epidemic has added a severe obstacle to CR programs, and many hospitals may not offer CR to minimize the risk of infection.³⁹ With increasing emphasis on social distancing and caregiving strategies for out-of-hospital patients, it seems a crucial time to revisit the value of home-based CR.⁴⁰ Less restricted by the epidemic, home-based CR, which is transport-free, less costly, and flexible, allows for uninterrupted care for patients.⁴¹ Future research could explore whether patient preferences for CR have shifted following the COVID-19 epidemic, and if so, what the reasons are and whether a new CR program needs to be constructed.

As a crucial component of secondary prevention in CVD, CR is a multidisciplinary program that includes exercise training, nutrition counseling, psychological management, patient education, and risk factor modification.^{42,43} Regardless of age and gender, patients identified exercise training and nutrition counseling as the most critical, and smoking cessation as the least important.^{23,26} Studies have shown that exercise plays an irreplaceable role in decreasing cardiovascular risk factors and reducing hospital admissions.⁴⁴ There is consensus that proper nutrition can reduce CVD and protect the heart.⁴⁵ The importance of smoking cessation varies, with smokers considering it important while non-smokers consider it unimportant.⁴⁶ Whether patient preferences differ between males and females, older and younger patients, due to different statistical methods, have not been consistently concluded and need to be explored in more studies. In addition, patient preferences can be taken into account, and patients can be involved in decision-making when developing CR programs in the future. If shared decision-making can benefit patients more, then such CR programs are worth generalization.

Exercise-based CR is recognized internationally as a class 1 clinical practice recommendation for patients with CVD.⁴⁷ Our study found that patients rated progress discussion and encouragement as most important, and non-conflicting with other activities as least important.^{22,28} When specialists discuss their conditions and encourage patients, patients are more likely to adhere to the CR program and achieve the desired results.⁴⁸ Most patients who participate in CR place CR program as their priority, and when CR conflicts with other activities, they tend to prefer CR.⁴⁹ Female patients tend to have a greater fear of exercise and a greater lack of social support, thus desiring more individualized attention.⁵⁰ Social stereotypes of men and their higher resilience make them more reluctant to express pain, so they prefer CR with a lower incidence of pain during exercise.⁵¹ Study of adults revealed that patients intensely disliked exercise intervention using telehealth.³² Due to the fact that telehealth solves transportation and time constraints and has lower economic costs, an increasing number of patients show an interest in exercise intervention using telehealth.^{52–54} In addition, patient preference indicated that there is more need for information on exercise intervention than currently available.³⁴ This is consistent with the study of Carolina et al, who believed that specific guideline recommendations are underutilized, the applicability of exercise interventions is inadequate, and still needs to be promoted.⁵⁵ Future research could be devoted to implementing specific guideline recommendations for exercise-based CR and improving the applicability of exercise intervention.

More than a third of patients with CVD suffer from anxiety or depression, leading to increased adverse cardiovascular events, poorer quality of life, and higher healthcare costs, making effective psychological interventions essential.⁵⁶ There is evidence that the longer the waiting time before CR, the more severe the anxiety and depressive symptoms may be. In addition, some patients experience anxiety and depressive symptoms after CR, therefore, timely and longer interventions are indispensable.^{57,58} Notably, patients prefer to receive psychological interventions at home.³⁶ On the one hand, this study was conducted during an epidemic so that patients felt safer at home. On the other hand, patients thought they could better share their feelings with their families at home, making psychological interventions more effective.⁵⁹ Future attempts could be made to explore the impact of different settings of delivering psychological intervention on patient prognosis.

Some limitations of this systematic review should be noted. First, due to the lack of original literature, only exercise and psychological intervention are summarized in CR contents. Original research on other contents of CR could be conducted in the future to refine patient preferences for CR. Second, due to the heterogeneity of included studies, we could not rank all attributes of patient preference. Third, despite the increasing emphasis on patient decision-making and patient preference, only 3 of the 11 quantitative studies collaborated with patients on attribute selection for the CR program.⁶⁰ Excluding patients from attribute selection may result in selection bias and, therefore may lead to biased results for patient preference.¹⁷ Fourth, only English and Chinese studies were included. The lack of data in some regions and the variability of healthcare systems between the areas limit the generalizability of the results.^{61,62}

Conclusion

This systematic review summarizes patient preferences for CR and its related factors in the hope of increasing CR effects and improving patient prognosis. Despite the rapid development of telehealth, most patients still prefer hospital-based rather than home-based CR. Regarding CR components, exercise training and nutrition counseling are the priorities, while smoking cessation is the least valued. In exercise intervention, progress discussion and encouragement were rated as most important, and non-conflicting with other activities was rated as least critical. As for psychological intervention, most patients were willing to accept psychological intervention, and a few patients wanted to heal the trauma with the passage of time. However, with the emergence of the COVID-19 epidemic and the development of telehealth, patient preferences may change in the future, and more studies still need to be included to validate the findings of this review.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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