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Review Article

Telerehabilitation In Monitoring Treatment of Heart Disease Patients: Literature Review

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Abstract

Aims: Heart disease is a chronic disease that affects the patient's physical and psychological adaptation. Currently, cardiac rehabilitation focuses on delivering rehabilitation components remotely using technology via telerehabilitation.
Objective: The purpose of this review is to identify the use of telerehabilitation in monitoring signs and symptoms of heart disease.
Methods: Literature review method with four databases PubMed, Proquest, Ebsco, Cochrane Library, Taylor & Francis database, and identification of gray literature, spanning 2011-2021, and 24 articles were reviewed.
Results: The results of the review show that cardiac rehabilitation components are provided through various tele media mobile phones, messenger applications (SMS, QQ, and WeChat), videoconferencing, online information (websites, emails), e-visit, and virtual reality (VR). Telerehabilitation is useful in monitoring exercise capacity, resting systolic blood pressure, blood pressure control, ECG monitoring media, monitoring of dysrhythmias (atrial fibrillation/AF), complaints of fatigue, monitoring of dyspnoea symptoms, hemoglobin and electrolyte levels. sodium and potassium), and depressive symptoms.
Conclusions: Telerehabilitation can be an alternative for continuous care of patients in monitoring signs and symptoms of heart disease, both physical and psychological aspects.

Keywords
cardiovascular disease, physical, psychological, remote rehabilitation.

INTRODUCTION

Cardiac rehabilitation has evolved from an exercise-only program to a comprehensive program that includes education and social support in addition to addressing other cardiovascular disease risk factors, the comprehensive program includes nutritional, psychological, and smoking cessation counseling, as well as cholesterol and blood pressure control (1). However, several things cause obstacles to its utilization and availability of cardiac rehabilitation including access problems such as the location of services, long distances to rehabilitation centers, transportation problems, costs, lack of insurance coverage for rehabilitation costs for individuals who are not aware of existing services or feel they do not need cardiac rehabilitation,

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geographical problems such as people living in rural areas also experience obstacles in carrying out cardiac rehabilitation due to distance, cost and transportation problems (2–4).

To keep cardiac rehabilitation programs running, many cardiac rehabilitation centers are focusing on remote delivery of cardiac rehabilitation components, this increased attention, as well as insights learned over the years, can help improve telerehabilitation delivery and increase participation (5). Telerehabilitation is the use of information and communication technology to provide rehabilitation services (6–8). Improves the patient's short-term prognosis as in heart failure after hospital discharge, telerehabilitation is as beneficial as outpatient rehabilitation (9).

However, the current challenge is other psychological aspects such as depression and anxiety are real illnesses that can affect the whole body, including the cardiovascular system, often overlapping symptoms of cardiovascular disease, such as palpitations, chest tightness, and shortness of breath, which occur in healthy people, including those caused by stress , making the determination of causal or mental health-related functions very challenging where so far the focus of treatment has been on managing symptoms and risk factors, rather than feelings and emotions (10). Cardiac rehabilitation for six weeks has been shown to improve quality of life, levels of physical activity, anxiety, and depression, which can be maintained after one year, with higher depression rates with lower quality of life (11), to improve health behavior, it is very important to overcome the possible psychological stress (12). Therefore, we conducted this review to evaluate the telerehabilitation program in its use to monitor signs and symptoms of heart disease, both physically and psychologically from the patient.

METHODS

Design

The design used is a literature review.

Searching strategies

Article searches in the 2011-2021 period were conducted through four databases, namely PubMed, EBSCO, ProQuest, Cochrane Library, Taylor & Francis Online, and gray literature, based on PICO elements (population, intervention, comparison, and outcome) (13), using the boolean "OR" and "AND". Search keywords in each database using keywords, including Cardiac disease AND Telerehabilitation AND Stress, fatigue, sleep disorder, heart rate, anxiety, depression.

The inclusion criteria for searching were: 1) studies focus on telerehabilitation with the outcome include stress, fatigue, sleep disorder, heart rate, anxiety, depression. 2) studies published in English and Bahasa.

Data extraction

The information was gathered in accordance with the standard procedure of a researcher. Separate data collection was done by two reviewers. The process of cross-checking was carried out in the event that there were conflicting viewpoints. A dialogue will be held to try and reach an agreement, and if this could not be achieved, the third party would be consulted for consultation.

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Searching results

A total of 892 titles/abstracts were identified, and an additional 5 titles/abstracts were identified through a gray literature search. After removing the duplication obtained 872 titles/abstract. Then the screening process was carried out, and 783 articles were excluded, so that 83 articles were obtained. In the next stage, the full-text is studied more deeply to determine its feasibility. Of the 83 articles that were screened, 60 were excluded because the outcomes did not meet the inclusion, review, and study protocol criteria. So, there are 23 articles that deserve to be reviewed and meet the inclusion criteria. The PRISMA flow diagram (figure 1) illustrates the inclusion process carried out.

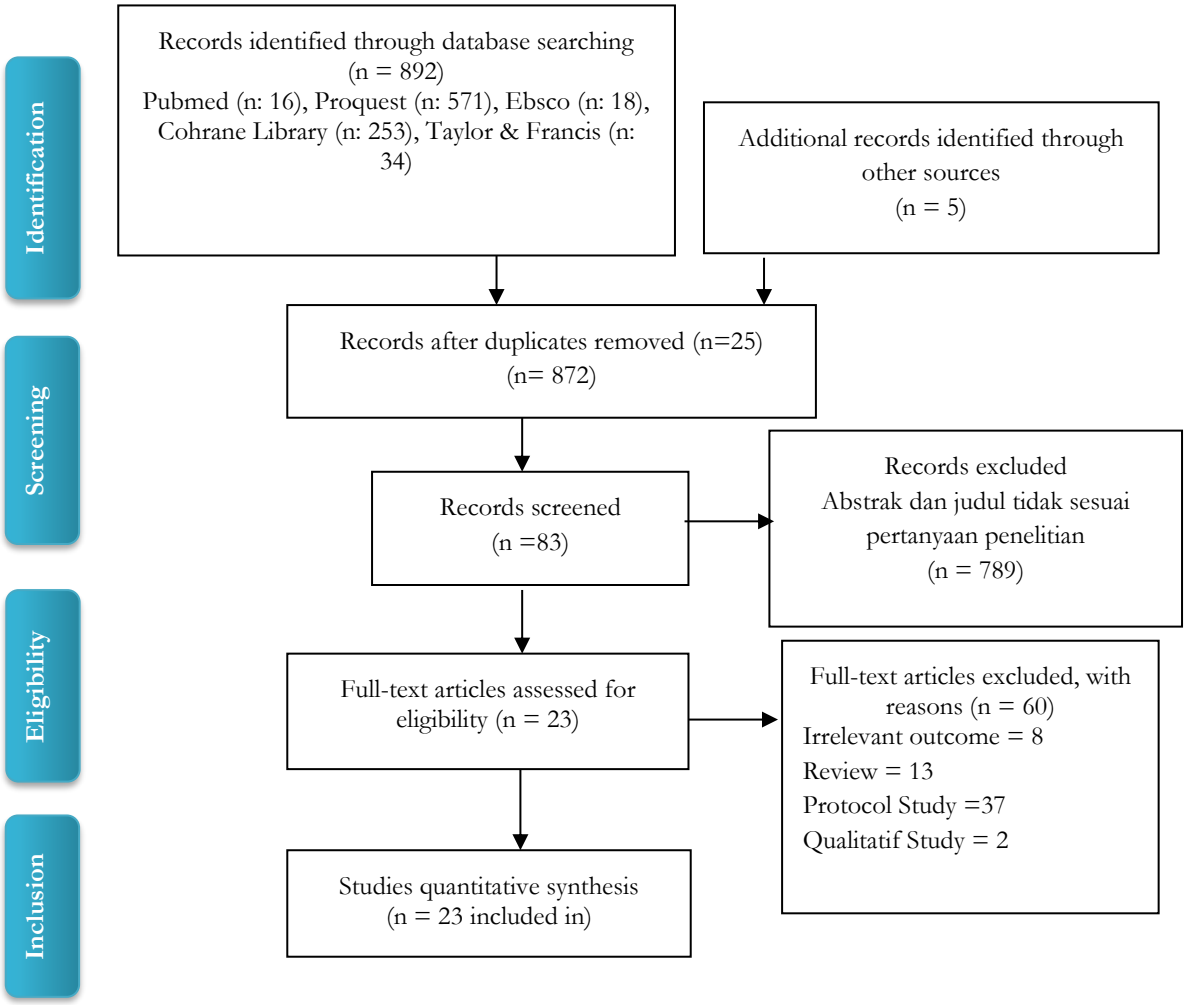

Figure 1. Prisma flow diagram

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RESULTS

Study characteristics

Based on the results of a literature search found 24 review articles (18 RCTs, 2 cohort studies, 1 retrospective study, 1 feasibility study, 1 monocentric study, and 1 prospective study), with a total sample of 3,433 patients, the majority of respondents with a diagnosis of CHD, more study locations conducted in rural areas such as in the city of Poland (7 studies). Other studies were conducted in China (2 studies), Providence (1 study), Norway (1 study), United Kingdom (2 studies), Greenville (1 study), Czech Republic (1 study), Iowa City (1 study), Porto (1 study), Warsaw (1 study), Californias (1 study), Australia (2 studies), Leiden (1 study), India (1 study), and Italy (1 study).

Description of the type of use of tele media and the type of intervention

1. Mobile phone, SMS, We Chat, QQ, video conferencing
   A total of 16 articles used telemedia which combined telephone calls, smartphone applications, SMS, social media platforms such as We Chat, QQ, video conferencing, tele ECG and sports supervision tools. The telemonitoring application is installed on the patient's mobile phone, then connected to the heart belts to monitor HR, fatigue complaints via a computer, then follow-up and feedback is done through the We Chat application, SMS and phone calls (14). On research (15), Lifestyle-based cardiac support program education via SMS.
2. QQ and We Chat social media platforms, used for surveillance, combined with online webcam training training programs (16). On research (17), weight, blood pressure, heart rate, drug use, and other sports are all tracked using the Movn mobile phone application, and given activity motivation and education via messages in the application.

In addition to follow-up media, the use of telephone telemedia is also used to provide sports training rehabilitation counseling programs to maintain the patient's physical activity behavior. (18), delivery of a phase 2 cardiac rehabilitation program based on American Heart Association guidelines in which patients were previously given a workbook to document exercise, a food diary, written equipment instructions, and an 'An Active Partnership for the Health of Your Heart' DVD, then telephone calls were made every week for 12 weeks to review program content to deliver program (19). On research (20) the use of mobile phones for monitoring patient blood pressure, maximizing the results of cardiac rehabilitation programs and patient treatment, coupled with an electronic outpatient visit program (e-visit). Telephone use in research Arjunan & Trichur (2021) as a reminder to practice the cardiac rehabilitation program from the booklet “Healthy Way to Healthy Heart”. Providing cloud/web-based physical activity behavior change interventions delivered via a smartphone application (Vire) (22).
Tele-EKG (mini EHO) is used to send ECG recordings via cell phone to monitoring centers in combination with psychological treatment via telephone (23); exercise monitoring telemonitoring tool combined with telephone monitoring by a doctor during exercise regarding the patient's current clinical condition, symptoms, medication history, and transmission of

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resting ECG and exercise ECG data (24). On research (25,26) tele ECG combined with mobile phone, central monitor, and telerehabilitation (exercise training supervision) set along with blood pressure and weight monitoring devices. Tele ECG is also used in research (27) combined with daily follow-up via mobile phone by a doctor regarding medical history and exercise approval. On research (28), after doing home-based exercise, the ECG data is sent to the monitoring center by telephone, while providing answers regarding their subjective health data, blood pressure, weight and medications.

a. Tablet computer, online internet, web or email

A total of four articles describe the provision of interventions through online media in the form of access to websites, online discussion forums, online activity calendars, and tablet computers. On research (29), all participants were given access to a website containing information on cardiac rehabilitation, as well as discussion rooms and an online activity schedule, but in the intervention group there was additional content tailored based on health behavior models via the website and SMS, while the basic internet-based intervention included general information about heart disease. and self-management, such as food, physical activity, smoking, and medication, as well as discussion forums. Use of interactive web-based rehabilitation programs can provide extensive secondary prevention education as well as private message access to rehabilitation specialists (30).

On research (31), physical activity programs/exercise training and teleconsultation are carried out regularly, PolarFlow web platform is used as a means of monitoring patient HR, linked to Polar M430 HR monitor and H10 chest sensor (Kempe, Finland), participant profile web is created on the web platform which provides benefits for HR monitoring , making exercise diaries, sources of historical information on training activity data or comparing training values.

b. Virtual Reality (VR)

Three studies describe virtual cardiac rehabilitation programs. Sports training programs are provided virtually and the Kinect-RehabPlay VR program that has been installed at the participant's home via a computer, where Kinect-RehabPlay consists of three modules namely the VR environment, Kinect sensors, and a software package for monitoring, “Exercise diary” as patient HR self-monitoring tool (32).

Another virtual rehabilitation program carried out on research (33) and (33) via a TierOne VR device. A VR set consists of a computer dedicated to 3D graphics processing, VR glasses (HTC VIVE PRO, 2017, New Taipei City, Taiwan) that allow the display of high-resolution images with high image quality (90 Hz), and a manipulator that translates the patient's hand movements. into the virtual world, the computer translates the user's movements into a virtual environment in real time, plus surround sound effects through the built-in headphones, the therapy is based on the metaphor of a virtual therapy garden, allowing patients to rest and relax.

This virtual therapy involves all of the patient's senses (sight, hearing, and

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kinesthetic), strengthens virtual world immersion, calms and places the patient in a state of psychophysical relaxation, remembers associations associated with previous pleasant sensations, improves mood, reduces anxiety, increases motivation to participate actively. in the rehabilitation process, cognitive activation, and stimulation of the patient's creativity are all goals of therapy (34).

1. Outcome measurement
   a. Effects on physiological aspects

      Based on a review of the included articles, the study assessed the benefits of telerehabilitation on the physiological aspects of increasing exercise capacity (VO2peak, 6-minute walk test (6MWT), METs, ISWT), HR peak, HR rest, heart rate recovery (HRR), HR variability (HRV), blood pressure, dysrhythmia complaints, fatigue, dyspnoea complaints, hemoglobin, sodium and potassium levels of the patient. Three studies show benefit in increasing peak oxygen consumption (peak VO2) (14,23,26), one study assessed improvement METs (24), and three studies assessed an increase in 6MWT (16,17,35), one study assessed improvements in the Incremental Shuttle Walking Test (ISWT) (17). Other indicators that reflect the patient's exercise tolerance and cardiopulmonary function are peak HR, rest HR, and heart rate recovery (HRR). Two studies assessed HR peaks, which showed recovery in the study Song et al. (2020), but did not show a significant effect in the study of Szalewska, Niedoszytko, et al. (2015), however, the heart rate recovery indicator (HRR) showed improvement and a decrease in HR rest also occurred. One other study also showed a decrease in HR rest and HRR (26). Study (Peng et al., 2018 showed a significant reduction in HR rest. One study conducted an assessment of the function of the autonomic nervous system balance with indications of heart rate variability (HRV) and heart rate turbulence (HRT), which showed insignificant results. (26). One study showed a significant value for improving cardiorespiratory fitness (31).

      Three studies measured the benefits of blood pressure monitoring. Two studies showed results in lowering resting systolic blood pressure and one study showed controlled blood pressure results, patients can measure and transfer blood pressure accurately. (20), and significant effect on diastolic blood pressure (21). In addition, telerehabilitation is also a medium for monitoring ECG (20), atrial fibrillation (AF) dysrhythmias (25). Telerehabilitation also has a positive effect on complaints of fatigue (36), improvement of dyspnoea symptoms (Bernocchi et al., 2018), hemoglobin and electrolyte levels (natrium dan kalium) (21).

   b. Effects on psychological aspects

      A total of 14 studies reported on the assessment and monitoring of psychological symptoms/ complaints such as depression, fatigue, anxiety, sleep disorders, and stress. Seven studies reported

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a symptom-reducing effect on depression (18,19,23,28,33,34,37), the two studies the effect is not significant but shows a change in the total score and the mean value of the DASS measurement dimension of 21(22,32). Another study showed insignificant results in reducing depressive symptoms (32).

Seven studies reported an anxiety assessment; two studies reported a reduction in anxiety scores (HADS-Anxiety) (33,34), and four other studies reported no significant effect on reducing anxiety (Antypas & Wangberg, 2014; Brough et al., 2014; Peng et al., 2018; Vieira et al., 2018). One study reported a benefit in reducing fatigue symptoms (36), one study reported a reduction in sleep disorder scores (28) , However, one study reported a non-significant effect on stress symptoms (32).

DISCUSSION

Heart disease is known to be the most common cause of death and disability worldwide (39). Several types of heart disease such as CHD and others are recommended, referred to cardiac rehabilitation, because it has been proven to be effective in reducing the risk of cardiovascular death, improving functional ability and quality of life, it is hoped that the continuity of this treatment can improve patient clinical outcomes. (40).

The results of this review show the benefits of telerehabilitation in monitoring signs and symptoms of heart disease from both physiological and psychological aspects. Various telemedia used showed significant benefits to changes in exercise capacity; increased peak oxygen consumption (peak VO2) (14,23,26), increase in METs (24), increase 6MWT (16,17,35), and incremental Shuttle Walking Test (ISWT) improvements (17), a decrease in resting systolic blood pressure and one study showed the results of controlled blood pressure, patients can measure and transfer blood pressure accurately (20), and significant effect on diastolic blood pressure (21), ECG monitoring media (20), atrial fibrillation (AF) dysrhythmias (25), reduction in fatigue complaints (36), improvement of dyspnoea symptoms (35), hemoglobin and electrolyte levels (sodium and potassium)(21). As for the psychological effect, it provides positive benefits for depressive symptoms (18, 19, 23, 28, 33, 34, 37), decrease in fatigue symptoms (36), decrease in sleep disorder score (28).

The current system of inpatient and outpatient rehabilitation must be maintained indefinitely (41). A coordinated approach is needed to maintain continuity and improve patient outcomes, continuity of care refers to the provision of services in a consistent, logical, and timely manner, covering three different domains: information, management, and relational continuity, flexibility of the cardiac rehabilitation model, referral process, appointment management appointments, and program availability (40).

Continuing nursing is a concern in the presence of COVID-19, so the implementation of adaptive strategies for cardiac rehabilitation is

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recommended, including home-based cardiac rehabilitation (42), use of telehealth to ensure continuity of this essential service (42,43). Telerehabilitation is the use of information and communication technology to provide rehabilitation, where nurses act as educators, collaborators, and consultants in providing nursing care through high-tech interventions, requiring interdisciplinary collaboration across various health professionals. (41).

The benefits of telerehabilitation make it easy to conduct virtual outpatient visits (e-visit), monitoring, to maximize the results of cardiac rehabilitation programs and patient treatment (20), enables healthcare providers to track patient health and spot problems before they become serious (41). Patients included are at low to moderate risk, if the program is not ideal from an exercise point of view for high-risk patients, such as those with left ventricular assist devices and heart transplant recipients, but the program provides useful teaching about nutrition, the need for medication adherence, and other lifestyle adjustment methods (42).

LIMITATIONS

Limitations related to the heterogeneity of the types of diseases evaluated are diverse, it is necessary to study with a large number of homogeneous sample criteria for further systematic reviews.

CONCLUSION

Several methods of telerehabilitation intervention can be carried out in heart disease for continuous care of patients in monitoring signs and symptoms of heart disease from both physical and psychological effects, and preventing worse problems from occurring.

IMPLICATION

Telerehabilitation can be used by nurses who act as educators, collaborators, and consultants in providing nursing care through high-tech interventions, requiring interdisciplinary collaboration across various health professionals (41).

CONFLICT OF INTEREST

There is no conflict of interest in writing this review.

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