



The Potential of Home-based Cardiac Rehabilitation Via Telehealth in Patients with the Post-Acute Coronary Syndrome in Indonesia: A Literature Review Study

Lutfian¹, Nur Rohmawati², Nila Uli Saadah³

^{1, 2, 3}Faculty of Nursing, Universitas Jember, Jember, Indonesia

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CORRESPONDENCE

E-mail: lutfian.ardianysah@aiasec.net
nurrohma2910@gmail.com
nilaulis@gmail.com

A B S T R A C T

Patients with post-acute coronary syndrome (ACS) require cardiac rehabilitation. However, there were obstacles in in-hospital cardiac rehabilitation (IHCR), so that it impacts on recurrence and a decreased quality of life. This paper analyzes the potential of home-based cardiac rehabilitation (HBCR) via Telehealth in post-ACS patients in Indonesia. It was a literature review study. We used articles from electronic media through the keywords home-based cardiac rehabilitation, Telehealth, and acute coronary syndrome. Journals were obtained through search sites on Google Scholar, Science Direct, PubMed, and ProQuest. The identification criteria were using Indonesian and English with the year of publication from 2015 to 2020. Then, we analysed and synthesized eligible publications using the PRISMA method. Findings from eight journals showed that the most common barriers for patients in in-hospital cardiac rehabilitation were logistical barriers (distance, time, functional status) and the patient's insufficient knowledge regarding the importance of cardiac rehabilitation. HBCR is an implementation model that has the potential as an effective solution in overcoming logistical limitations between patients and doctors. Care providers in several developed countries have implemented HBCR. It significantly improved medication adherence, outcome, and safety profile in patients. Furthermore, virtual cardiac rehabilitation provided the same outcome and safety profile as IHCR. Indonesia needs to develop HBCR via Telehealth for secondary prevention management in patients after heart events, especially ACS. Developing Telehealth could reduce complications and recurrence, improve lifestyle and physical activity, lower the risk of rehospitalization, and reduce treatment costs.

INTRODUCTION

Heart disease is one type of catastrophic disease requiring comprehensive treatment. However, cardiac rehabilitation in several parts of Indonesia has not been directly proportional to the high number of patients. Patients after acute cardiovascular events require cardiac rehabilitation because it is an effective intervention and can reduce mortality and morbidity (Smolderen, 2017). Cardiac rehabilitation can allow post-cardiovascular patients to adapt to cardiac physiologic changes. It is one of the aspects of self-management and is essential in implementing discharge planning and a continuum of care (Wolf *et al.*, 2016).

In Indonesia, ischemic heart disease such as acute coronary syndrome (ACS) is the number one cause of increased mortality and morbidity rates. The number of ischemic heart disease patients with Disability Adjusted Life Years (DALY's) increased by 10.5%, from 5.9 million in 2006 to 6.25 million in 2016. In addition, The estimated incidence of DALYs was 200 per 100,000 population (Sunjaya, Sunjaya, and Priyana, 2019). Meanwhile, only 11.35% of patients with coronary heart disease (CHD) underwent cardiac rehabilitation in a hospital in Bandung (Saripudin, Emaliyawati en Somantri, 2018). Suboptimal

cardiac rehabilitation causes decreased quality of life and increased average claim for financing treatment in heart disease.

Several obstacles can cause low patient participation in the cardiac rehabilitation program. This condition impacts disease recurrence and decreases the quality of life. A prior study reveals the number 1 barrier to cardiac rehabilitation in CHD patients is logistical barriers – distance, transportation, and time (Saripudin et al., 2018). The obstacles are because Indonesia is an archipelagic region. In addition, cardiac rehabilitation centers in 2019 had not reached all areas in Indonesia.

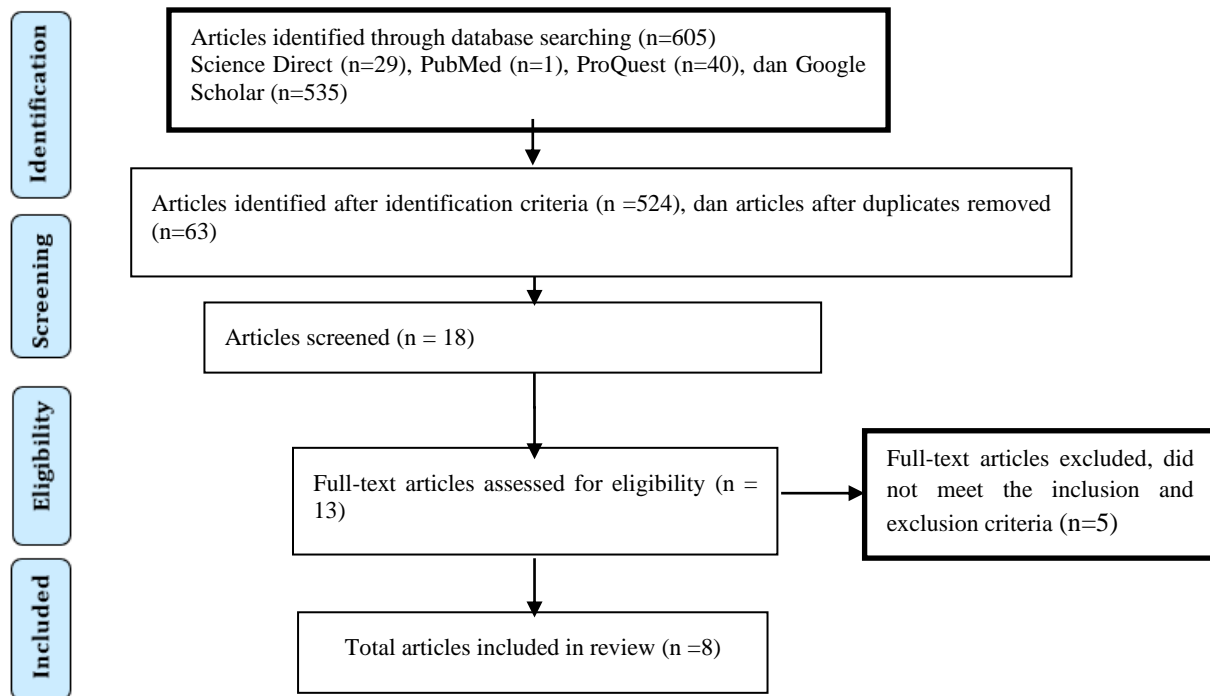
According to the American Heart Association (AHA), screening in patients with heart disease is crucial to assess the severity and typical symptoms of cardiovascular disorders. The vital point of the screening is working with the patient to identify a specific individualized treatment plan and further monitor the patient's symptoms (Smolderen, 2017). One potential resource to support self-management and navigation of health care is Telehealth.

Telehealth has the potential to develop home-based cardiac rehabilitation (HBCR) as an effort to overcome logistical barriers for patients. It includes symptom monitoring without reducing the frequency of access to health facilities. In addition, it is supported by an accessible 24-hour service. Thus, Telehealth can be a strategy to change behavior in the community. This paper analyzes the potential of home-based cardiac rehabilitation (HBCR) via Telehealth in post-ACS patients in Indonesia.

METHOD

This study was a literature review. We used articles from electronic media through the keywords home-based cardiac rehabilitation, Telehealth, and acute coronary syndrome. Journals were obtained through search sites on Google Scholar, Science Direct, PubMed, and ProQuest. The identification criteria were using Indonesian and English with the year of publication from 2015 to 2020. Then, we analysed and synthesized eligible publications using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) method.

Figure 1. PRISMA flow diagram of article selection



RESULTS

Table 1. Summary of literature review findings

Authors, Publication year	Country	Title	Sample/ article	Method	Findings
Wakefield <i>et al.</i> , 2019	United States	Creating and disseminating a home-based cardiac rehabilitation program: experience from the Veterans Health Administration	21 respondents	Mixed-methods: Quantitative and qualitative studies	The predisposing factors for the success of the cardiac base home rehabilitation (CBHR) program were leadership, availability of resources, easy access to knowledge and information, also planning, and support from family members. Respondents with middle to upper economic levels tended to be more successful in implementing CBHR.
Moulson <i>et al.</i> , 2020	Canada	Training/Practice Contemporary Issues in Cardiology Practice Cardiac Rehabilitation During the COVID-19 Era: Guidance on Implementing Virtual Care	Six articles	Rapid review	Virtual cardiac rehabilitation offers an alternative to providing the utmost care. It could give the same outcome and safety profile as in-hospital cardiac rehabilitation. Telecardiology providers must focus on the utilization and distribution of facilities and infrastructure and the availability of information sources for patients.
Thomas <i>et al.</i> , 2019	United States	Home-Based Cardiac Rehabilitation	-	Meta-analysis and systematic review	Implementation of home-based and in-hospital cardiac rehabilitation for 3 to 12 months showed the same improvement in outcomes.

Drwal <i>et al.</i> , 2020	United States	Cardiac Rehabilitation During COVID-19 Pandemic: Highlighting the Value of Home-Based Programs	Seven articles		Literature review	HBCR is an implementation model that has the potential to be an effective solution in overcoming logistical limitations between patients and doctors.
Saripudin <i>et al.</i> , 2018	Indonesia	Barrier Of Coronary Artery Disease (CAD) Patient Who Undergoing Cardiac Rehabilitation	42 Respondents		Quantitative descriptive	The most common barriers for patients in in-hospital cardiac rehabilitation were logistical barriers (distance, time, functional status) and the patient's insufficient knowledge regarding the importance of cardiac rehabilitation.
Sunjaya <i>et al.</i> , 2019	Indonesia	Insights and challenges of Indonesia's acute coronary syndrome telecardiology network: three-year experience from a single center in West Jakarta, Indonesia	2,017 ACS patients		Quantitative descriptive	Primary care facilities could efficiently perform cardiac rehabilitation through a telecardiology program. Over the three years, there was reduced patient ischemic time, from a median of 330 minutes to 275 minutes. The success of a telecardiology program requires good network availability.
Wolf <i>et al.</i> , 2016	Sweden	An eHealth Diary and Symptom-Tracking Tool Combined with Person-Centered Care for Improving Self-Efficacy After a Diagnosis of Acute Coronary Syndrome: A Substudy of a Randomized Controlled Trial	199 ACS patients		Randomized Controlled Trial	ACS patients who used Telehealth combined with patient-centered care (PCC) experienced four times faster improvement than patients who only performed PCC ($p=0.005$). In addition, the group using Telehealth had a significant increase in self-efficacy.
Nuraeni <i>et al.</i> , 2016	Indonesia	Factors Influenced the Quality of Life among Patients Diagnosed with Coronary Heart Disease	100 ACS patients		Cross-sectional	Factors affecting the quality of life in CHD patients included depression, anxiety, and revascularization. Furthermore, depression was the variable with the most significant effect. Thus, health providers should perform management to prevent depression.

Adherence to cardiac rehabilitation is one indicator that can improve patients' quality of life with CHD. Saripudin (2018) found that the most common barriers for patients in in-hospital cardiac rehabilitation were logistical barriers (distance, time, functional status) and the patient's insufficient knowledge regarding the importance of cardiac rehabilitation. Drawl *et al.* (2020) state that HBCR is an implementation model that has the potential as an effective solution in overcoming logistical limitations between patients and doctors. Care providers in several developed countries have implemented Home-based cardiac rehabilitation. HBCR significantly improved medication adherence, outcome, and safety profile in patients with CHD. Furthermore, Moulson *et al.* (2020) suggest virtual cardiac rehabilitation

that provided the same outcome and safety profile as IHCR (Wolf *et al.*, 2016; Sunjaya, Sunjaya and Priyana, 2019; Thomas *et al.*, 2019; Wakefield *et al.*, 2019; Moulson *et al.*, 2020).

DISCUSSION

1. Acute Coronary Syndrome in Indonesia

In Indonesia, ischemic heart disease such as acute coronary syndrome (ACS) is the number one cause of increased mortality and morbidity rates. The number of ischemic heart disease patients with Disability Adjusted Life Years (DALY's) increased by 10.5%, from 5.9 million in 2006 to 6.25 million in 2016. The Strong Heart Study by the American Heart Association in 2019 revealed that women aged 45 years had a higher incidence of cardiovascular disease than men (Muller *et al.*, 2019).

The characteristics of most patients with ACS in Indonesia were young adults (45-54 years) and had a history of hypertension, dyslipidemia, smoking, and hereditary diseases (Wahid, Risiko, and Koroner, 2019). Thus, the average ACS patients were generation X, and Y. Sanjaya (2019) investigated Indonesia's Acute Coronary Syndrome telecardiology network called iSTEMI. The study found that iSTEMI potentially increased interhospital referrals in implementing primary Percutaneous Coronary Intervention (PCI) procedures in Jantung dan Pembuluh Darah Harapan Kita Hospital, Jakarta.

The availability of the iSTEMI network in West Jakarta facilitated consultation and confirmation of diagnosis and treatment with the National Cardiovascular Center, with a confirmation presentation reaching 97%. In addition, there was a reduction in the time for patient transfer and procedures for the acute coronary syndrome. As a result, there was reduced patient ischemic time, from a median of 330 minutes to 275 minutes (Sanjaya, 2019). In addition, a survey by the Indonesian Internet Service Providers Association in 2016 stated that 132.7 million or 51.8% of Indonesia's population could access the internet. Thus, Telehealth has the potential to be developed into home-based cardiac rehabilitation in post-acute coronary syndrome patients.

2. Home-based Secondary Prevention Program for Patients with Acute Coronary Syndrome Using Telehealth

Home-Based Cardiac Rehabilitation (HBCR) can overcome obstacles in implementing in-hospital cardiac rehabilitation (IHCR). In IHCR, there are obstacles to patient participation, including logistical barriers, health workers, and patient psychological factors (Drwal *et al.*, 2020). HBCR can be an alternative for stable low-moderate risk patients after hospitalization. Several countries have implemented HBCR for self-monitoring the management of patients with cardiovascular problems and monitoring patients who discontinue IHCR. HBCR is considered more potential because patients can consult health staff every

day. In contrast, The IHCR is only done a few hours weekly (Thomas, 2019). Telehealth allows patients to consult with health workers via smartphones to overcome logistical barriers in IHCR.

The core components of HBCR are patient assessment, physical exercise, dietary counseling, risk factor management (smoking, blood pressure, weight, diabetes mellitus), and psychological intervention (Thomas, 2019). The outcome of HBCR is to help reduce the recurrence of secondary cardiovascular events after hospitalization. In addition, it helps restore optimal physical, mental, social, vocational, and sexual life after changes in health status (Nuraeni, 2016). The following are components of home-based cardiac rehabilitation:

1) Pain Management

Patients after cardiovascular events often complain of chest pain. The pain is different because it is above the pain threshold and tolerance. In addition, there is a decrease in circulating endorphins and enkephalins hormones released by the pituitary. There are pharmacological and non-pharmacological interventions in HBCR. The goal of pharmacological intervention is to increase blood flow by increasing the oxygen supply and reducing the myocardium's demand for oxygen. While non-pharmacological interventions prevent pain, reduce the risk of decreased cardiac output, increase self-care ability, reduce anxiety, and prevent complications.

Non-pharmacological interventions include rest and thermotherapy. Rest serves to reduce oxygen consumption by the myocardium. In addition, thermotherapy uses hot packs warmed at a temperature of 50°C for 20 minutes per day or according to the patient's comfort. Thermotherapy can manage pain through surface tissue (skin) and muscle tissue. Stimulation of heat receptors will increase the secretion of endorphins so that it can reduce pain levels. In addition, endothelial duplication and increased nitric oxide (NO) will help myocardial perfusion, thereby reducing pain (Moradkhani en Baraz, 2018).

2) Stress Management / Psychological Traumatic Healing

Management of traumatic stress in post-acute coronary syndromes is rarely known, but it can have long-term effects on adopting healthy behaviors. Patients after cardiovascular events experience varying levels of stress, but the probability is higher than that of the general population (Tulloch, Greenman en Tassé, 2015). One of the most extreme of traumatic stress is Post Traumatic Stress Disorder (PTSD). PTSD is associated with cardiovascular reactivity, such as increased proinflammatory and endothelial dysfunction. Furthermore, it can develop into an exacerbation of heart disease (Tulloch, Greenman en Tassé, 2015).

Primary Care PTSD Screen (PC: PTSD) is a Valid posttraumatic stress screening to detect anxiety (Roberts *et al.*, 2016). In addition, psychoeducation about the signs and symptoms of PTSD and other psychological disorders related to heart disease is essential. It can help minimize symptoms and avoid exacerbations. It contains health education about sleep hygiene, rest schedule strategies, and relaxation

techniques (such as diaphragmatic breathing and progressive muscle relaxation). Furthermore, it is a nursing intervention to minimize stress (Tulloch, Greenman en Tassé, 2015).

3) Physical activity management

Support for staying physically active at home requires measurements of speed and distance. So it takes a particular device in a phone to measure these things. The target heart rate in independent physical exercise is 60-75%. Developing an android system such as an accelerometer system can be a solution for tracking location and measuring mobile phone motion's speed and direction. In addition, the accelerometer in the mobile phone can calculate the average daily energy expenditure level, which is visualized on a statistical graph. As a result, it can monitor the patient's physical activity.

4) Diet management

Diet management in CHBR is focused on the history of the food consumed and the time of daily consumption. Sources of nutrition can be adjusted to the patient's resources and can be monitored by health workers. In diet management, there is a modification of protein intake and a reduction in salt, saturated fat, and alcohol intake (Quiles en Miralles-visedo, 2014). Telehealth allows patients to input the type of food consumed. Then the care provider will evaluate and modify their food and measure the patient's BMI every week or month.

5) Patient assessment

The Seattle Angina Questionnaire - 7 (SAQ-7) is an assessment to evaluate the frequency of angina recurrence. It has 7 question items to measure the domains of physical limitations, angina stability, angina frequency, satisfaction with treatment, and perception of the disease. The instrument is valid for coronary artery disease and has high reliability and accurate predictive power (Chan *et al.*, 2014). Care providers can use this assessment to evaluate the success of CHBR.

3. Daily Monitoring of ACS patients via Telehealth

The growth of internet users in Indonesia in 2017 increased to 143.26 million from the previous year of 132.7 million users. There was a shift in the productive age generation of internet users. Internet users at the age of 19-34 were 74.23% and at the age of 35-54 years were 44.06% (Asosiasi Penyelenggara Jasa Internet Indonesia, 2017). In addition, the improvement of telecommunications via satellite, the Palapa Fiber Optic Ring project, 3G, 4G, and 5G networks provide connectivity access in almost all of Indonesia. Thus, there is an opportunity to develop preventive activities in the health sector with digital-based in Indonesia (Sunjaya, Sunjaya, and Priyana, 2019).

CHBR has the potential to increase physical activity, help control diet at home, improve medication adherence, counseling of stop smoking, and improve the patient's quality of life. Monitoring of post-hospitalized ACS patients is crucial to monitor clinical manifestations whether there is an improvement or

worsening of vascularization (Thomas et al., 2019). Telehealth via web and online applications in patients with cardiovascular disorders has been studied in several countries like Sweden and Japan. Daily activity measurements will be measured automatically in the mobile application. In addition, there is a questionnaire containing patient data and complaints every day. Furthermore, there are data on patient compliance in carrying out the intervention. Thus the care provider can evaluate the cardiac rehabilitation program (Wolf et al., 2016).

CONCLUSION

Indonesia needs to develop HBCR via Telehealth for secondary prevention management in patients after heart events, especially ACS. Developing Telehealth could reduce complications and recurrence, improve lifestyle and physical activity, lower the risk of rehospitalization, and reduce treatment costs.

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