JHPM Journal of Health Policy and Management (2024), 09(01): 119-130
Masters Program in Public Health, Universitas Sebelas Maret

Meta-Analysis
Open Access

A Meta Analysis: Effectiveness of Telemedicine to Improve Self-Care in Patients with Hearth Failure

Audria Ersananda[1)], Hanung Prasetya[2)], Burhanudin Ichsan[3)]

[1)]Masters Program in Public Health, Universitas Sebelas Maret
[2)] Study Program of Acupuncture, Health Polytechnics, Ministry of Health Surakarta
[2)] Faculty of Medicine, Universitas Muhammadiyah Surakarta

Received: 09 July 2023; Accepted: 28 December 2023; Available online: 16 January 2024

ABSTRACT

Background: Modern and sophisticated self-care education programs such as web-based methods and wireless networks can make changes in patient behavior to improve self-care management. Telemedicine is a potential alternative to continue providing patient health services by minimizing the risk of exposure and physical contact. This study aims to investigate relevant primary studies in order to assess the effectiveness of telemedicine to improve self-care in heart failure patients.
Subjects and Method: This study used a systematic review and meta-analysis with PICO namely, P: Patients with heart failure, I; using telemedicine, C: not using telemedicine, O: increasing self care for heart failure patients. By searching for articles in 3 databases namely PubMed, Google Scholar, Cochrane which were published from 2013 to 2023, entering the following keywords ("Heart Failure" OR "congestive heart failure") AND (Telemedicine OR "electronic health record" OR mHealth OR " mobile health" OR "mobile app" OR "telehealth" OR "healthcare system information") AND "self care" AND "randomized controlled trials". Articles were selected using PRISMA flow and data analysis using the Review Manager 5.3 application..
Results: 9 RCTs from Canada, the United States, Colombia, Australia, Hong Kong, Finland were selected for meta-analysis. Total sample was 1,018. Telemedicine was effective to improve self-care in heart failure patients (SMD= 0.33; 95% CI= 0.15 to 0.52; p= 0.004).
Conclusion: Telemedicine is effective to improve self care in heart failure patients.

Keywords: heart failure, self care, telemedicine

Correspondence:
Audria Ersananda. Master's Program in Public Health, Universitas Sebelas Maret. Jl. Ir. Sutami 36A, Surakarta, Central Java 57126. Email: audriaersananda@gmail.com. Mobile: 082233999407.

Cite this as:
Ersananda A, Prasetya H, Ichsan B (2024). A Meta Analysis: Effectiveness of Telemedicine to Improve Self-Care in Patients with Hearth Failure. Health Policy Manage. 09(01): 119-130. https://doi.org/10.26911/-thejhpm.2024.09.01.11.

BACKGROUND

Congestive Heart Failure (CHF) or heart failure occurs because the heart is unable to pump enough blood to meet the body's needs for oxygen and nutrients (Corwin, 2010). CHF patients have an influence on their physical condition, namely limitations in walking, climbing stairs, or doing daily activities. Cardiovascular disease is the main cause of death in the world, claiming around 17.9 million lives every year (WHO, 2020). Globally, as stated in the Global Health Data Exchange, the current prevalence of heart failure patients is 64.34 million cases, or

around 8.52 per 1,000 population (Institute for Health Metrics and Evaluation, 2020).

In Indonesia, there is an increase in the prevalence of heart and blood vessel disease from year to year. At least 15 out of 1000 Indonesians or around 2,784,064 individuals in Indonesia suffer from heart disease (PERKI, 2019). Data from the Indonesian Ministry of Health's Basic Health Research (Riskesdas) in 2018, the prevalence of heart failure in Indonesia based on a doctor's diagnosis is estimated at 1.5% or an estimated 29,550 people.

The characteristics of heart failure patients are readmission, debilitating symptoms, and poor quality of life (Norton et al., 2011). Various factors for heart failure patients result in decreased quality of life. This relates to the patient himself in terms of inadequate self-care management. Modern and sophisticated self-care education programs such as web-based methods and wireless networks can make changes in patient behavior to improve self-care management (Cao et al., 2019). According to (Muller et al., 2016) with the increasing use of technology in health care, telemedicine is highly recommended because it can expand remote service providers. Telemedicine can also broaden access and has the potential to become a health service that makes it easier for patients in rural areas and areas with less mobility.

The study conducted by Kiarosta et al. (2020) through smartphone application interventions offers potential benefits for disseminating health information to the wider community. Technology can generally be used to overcome geographic barriers and improve communication, this technology allows it to be used in marginalized rural areas where health services are often difficult to access or people who do not have time to go to health services to get their health information. Utilizing this technology is considered to be able to improve global health outcomes, especially in improving self-care

Based on this background, a comprehensive study of the main studies is needed to reach a more conclusive conclusion. Researchers are interested in conducting research using a systematic review approach to relevant research, namely by using meta-analysis. This study aims to investigate relevant primary studies in order to assess the effectiveness of telemedicine to improve self-care in heart failure patients.

SUBJECTS AND METHOD

1. Study Design

This study used this study using a systematic review and meta-analysis with PICO namely, P: Patients with heart failure, I; using telemedicine, C: not using telemedicine, O: increasing self care for heart failure patients. By entering the following keywords ("Heart Failure" OR "congestive heart failure") AND (Telemedicine OR "electronic health record" OR mHealth OR "mobile health" OR "mobile app" OR "telehealth" OR "healthcare system information") AND "self care" AND "randomized controlled trials".

2. Steps of Meta-Analysis

Meta-analysis analysis was carried out through 5 steps as follows:

1) Formulate research questions in PICO (Population: Patients with heart failure, Intervention: using telemedicine, Comparison: not using telemedicine, and Outcome: improving self care for heart failure patients).
2) Search for primary study research articles from 3 online databases, namely PubMed, Google Scholar, and Cochrane Library.
3) Conduct screening and quality assessment of primary research articles.
4) Extracting and analyzing data into the RevMan 5.3 application.

5) Interpret the results and draw conclusions

3. Inclusion Criteria

The inclusion criteria were full-text English articles and RCT.

4. Exclusion Criteria

The exclusion criteria from this study were the size of the results of the study which were incomplete or did not clearly describe the results, the year of publication was more than 10 years since the study was conducted, the intervention and study population were different.

5. Operational Definition

Self care is the practice of individual activities to take the initiative and shape their behavior in maintaining life, health and well-being. The measurement scale is categorical.

Telemedicine itself is defined as visual, audio and data communication including diagnosis, treatment, consultation and treatment and scientific discussion as well as the exchange of medical data in carrying out health practices that are carried out online and not face to face. The measurement scale is categorical

Heart failure is a collection of clinical symptoms characterized by decreased systemic perfusion, inadequate body metabolism due to impaired heart pump function (Heriansyah, 2019).

6. Istrument

This study is guided by the PRISMA flowchart and quality assessment using the Critical Appraisal Checklist for Randomized Controlled Study.

7. Data Analysis

The data in this study were analyzed using RevMan 5.3. Forest plots and funnel plots are used to determine the effect size and heterogeneity of the data. Data processing is carried out based on variations between studies by determining the use of an analysis model, namely the fixed effect model or the random effect model.

RESULTS

The process of searching for articles is done through several journal databases, namely Google Scholar, PubMed, Cochrane Library. The review process for related articles can be seen in the PRISMA flow. Figure 1. Research related to the effectiveness of telemedicine to improve self-care in heart failure patients consisting of 9 articles from an initial search process of 3,856 articles.

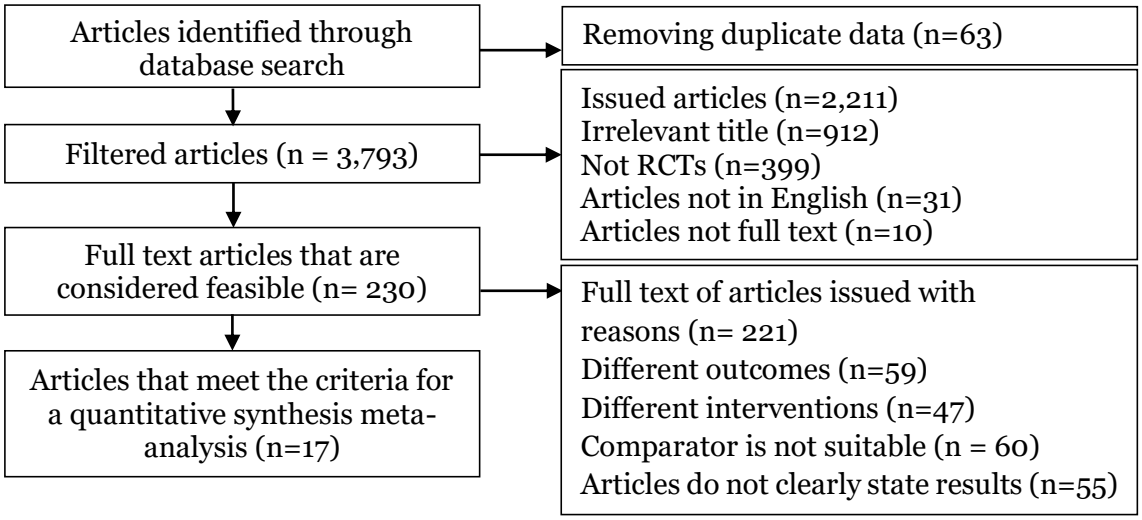

Figure 1. PRISMA Flow diagram

Figure 2. Map of the Research Area

Figure 2 shows the distribution area of the primary articles which are spread over 9 articles which are 4 articles from the United States, 1 article from Colombia, 1 article from Australia, 1 article from Hong Kong, 1 article from Finland, 1 article from Canada using a randomized controlled primary study design. trials.

Table 1. Assessment of the quality of randomized controlled trial studies "Effectiveness of telemedicine to improve self-care in heart failure patients"

Primary Study	Criteria											Total
	1	2	3	4	5	6	7	8	9	10	11	
Seto *et al.*, (2012)	1	1	1	1	1	1	1	1	1	1	1	11
Evangelista *et al.*, (2015)	1	1	1	1	1	1	1	1	1	1	1	11
Piette *et al.,* (2015)	1	1	1	1	1	1	1	1	1	1	1	11
Creber *et al.,* (2016)	1	1	1	1	1	1	1	1	1	1	1	11
Bashi *et al.*, (2016)	1	1	1	1	1	1	1	1	1	1	1	11
Athilingam *et al.,* (2017)	1	1	1	1	1	1	1	1	1	1	1	11
Dorsch *et al.*, (2021)	1	1	1	1	1	1	1	1	1	1	1	11
Fungyu *et al.*, (2022)	1	1	1	1	1	1	1	1	0	1	1	10
Clays *et al.,* (2021)	1	1	1	1	1	1	1	1	1	1	1	11

Note: 1=Yes, 0= No

Table 1 shows the results of the primary study quality assessment using the critical appraisal checklist for a randomized controlled trial consisting of 11 questions. With the following questions:

1) Does the experiment clearly answer the clinical problem?
2) Is the provision of interventions to participants or groups carried out randomly?
3) Are the patients included in the study worthy of being taken into account in the conclusion? Were all patients analyzed according to the randomized study groups?
4) Are patients, health workers and researchers blinded?
5) Were the study groups similar at the start of the study?
6) Apart from the intervention studied, were the study groups treated the same?
7) Was the intervention group large enough?
8) How precise is the estimation of the effect of the intervention?

9) Do the benefits provided by the intervention outweigh the costs and disadvantages?
10) Are the results of the research applicable to the local population or practice context?
11) Are all other clinically important outcomes considered in this article?

Table 2. Description of the primary studies included in the meta-analysis (randomized controlled trial design, total sample n=1.018)

Author	Country	Sample	P	I	C	O
Seto *et al.*, (2012)	Canada	100	Patients with heart failure (age 18 and over) from a cardiac clinic in Toronto, Ontario.	Receive a self care program with a cell phone-based tele-monitoring system.	Do not accept the telemonitoring system self-care program.	Improving self care in heart failure patients.
Evangelista *et al.*, (2015)	United States of America	42	Patients with heart failure (age 18 and older) from a hospital in Southern California.	Receive a self care program with a telephone-based remote monitoring system.	Do not accept self-care programs with remote monitoring systems by telephone	Patients experience increased self-care.
Piette *et al.*, (2015)	United States of America	362	Patients with heart failure at the VA Cleveland Medical Center outpatient clinic.	Receiving a mobile health-based self-care program.	Do not receive a mobile health-based self-care program	Self care in patients with heart failure has increased.
Creber *et al.*, (2016)	Colombia	93	Patients with heart failure treated at urban hospitals in cooperation with the University.	Receiving a self care program with a remote monitoring system in the form of a telephone.	Do not accept self-care program with a remote monitoring system in the form of a telephone.	Improving self care in heart failure patients.
Bashi *et al.*, (2016)	Australia	28	Patient with heart failure from a health clinic located in Brisbane, Australia.	Receive a web-based self-care program to access educational information.	Do not accept web-based self-care programs.	Improving self care adherence.
Athilingam *et al.*, (2017)	United States of America	18	Patients with heart failure who have received approval from the Institutional Review Board (IRV).	Received a mobile application-based self-care program called HeartMapp.	Do not accept a mobile application based self care program called HeartMapp.	Patients experience increased self-care.
Dorsch *et al.*, (2021)	United States of America	83	Patients who are being treated or who have been discharged due to heart failure aged 45 years and over.	Received a mobile app based self care program called ManageHF4Life.	Do not accept a mobile application based self care program called ManageHF4Life.	There is an increase in self-care in patients with heart failure.
Fungyu *et al.*, (2022)	Hong Kong	236	Patients with heart failure who are 55 years of age or older.	Receive a self care program with a remote monitoring system.	Not receiving self care program with remote monitoring system.	Improving self care in heart failure patients.
Clays *et al.*, (2021)	Finland	54	The patient with heart failure is undergoing outpatient care and is in stable condition.	Received a mobile application-based self-care program called HeartMan.	Did not receive a self-care program called HeartMan.	Improving self care in heart failure patients.

Table 2 provides descriptions of the 10 primary studies by RCT design that were included in the meta-analysis of the effectiveness of telemedicine to improve self-care in heart failure patients. There are 9 articles with a total sample of 1.018.

Table 3. Mean SD of the primary studies included in the primary study meta-analysis of the Randomized Controlled Trial

Author (Year)	Mean		SD	
	Intervention	Control	Intervention	Control
Evangelista *et al.* (2015)	65.9	57.9	13.1	14.6
Piette *et al.* (2015)	83.0	82.9	16.5	19.2
Dorsch *et al.* (2021)	69.9	74.6	2	2
Creber *et al.* (2016)	19.7	12.1	16.0	18.3
Seto *et al.* (2012)	73.3	11.6	65.5	15.8
Athilingam *et al.* (2017)	28.29	2.81	22.83	5.56
Fungyu *et al.* (2022)	74.08	68.74	21.42	19.95
Boyne *et al.* (2013)	17.4	20.8	4.5	5.8
Clays *et al.* (2021)	61.4	57.1	16.8	13.8

a. Forest Plot

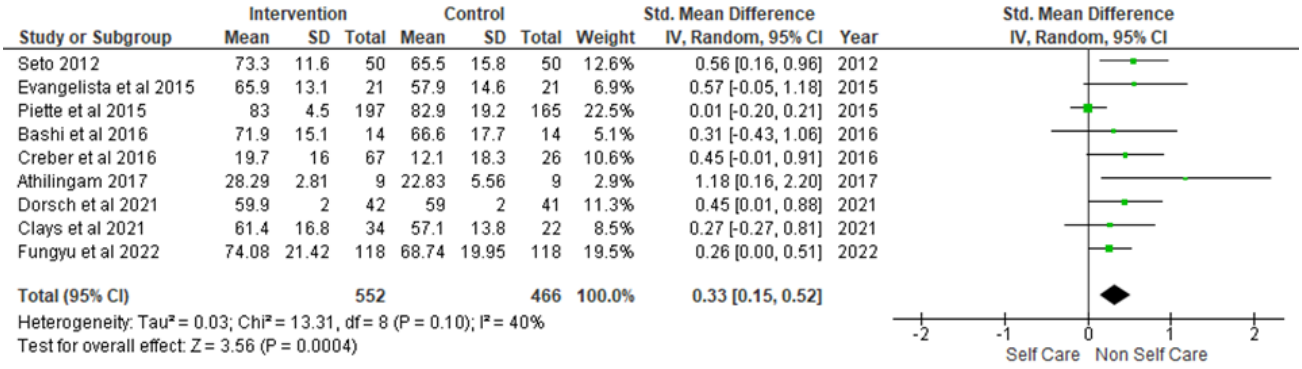

Figure 3. Forest plot meta-analysis of the effectiveness of telemedicine to improve self-care in heart failure patients

The forest plot in Figure 3 shows the effectiveness of telemedicine to improve self-care in heart failure patients and it is statistically significant. Heart failure patients who received telemedicine-based education had an average self-care value of 0.33 SMD units higher than those who did not receive the intervention (SMD= 0.33; 95% CI= 0.15 to 0.52; p= 0.004).

The forest plot also shows variations in the estimated effects of telemedicine-based self care with homogeneity between the primary studies that were carried out in this meta-analysis (I^2= 40%), thus calculating the effect estimates using the Fixed Effect Model approach.

b. Funnel plot

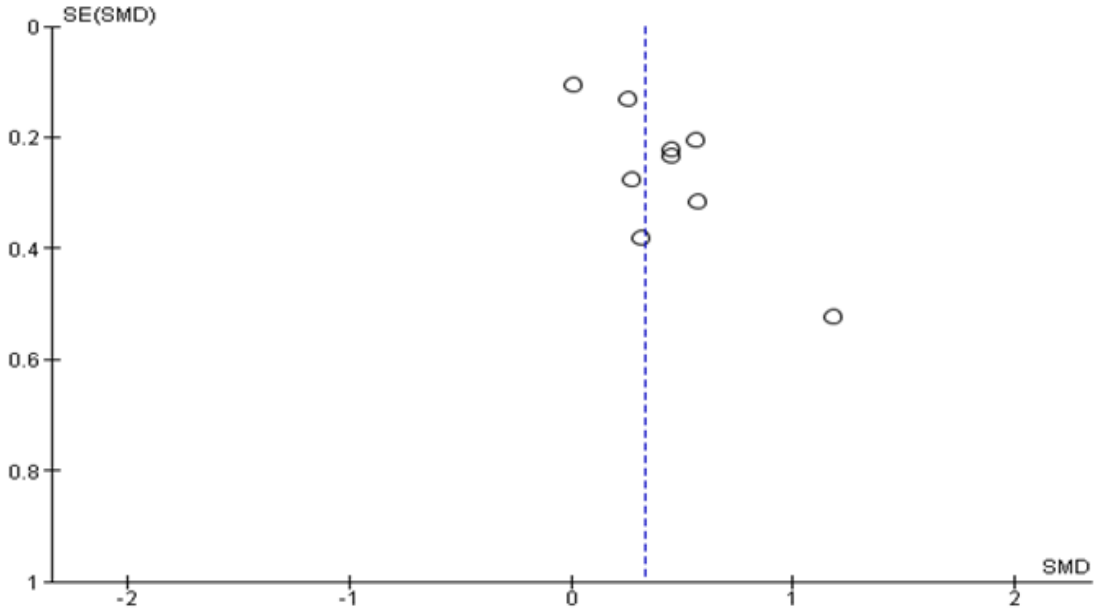

Figure 4 Funnel plot meta-analysis of the effectiveness of telemedicine to improve self-care in heart failure patients

The funnel plot in Figure 4 shows that the distribution of effect estimates is asymmetric, that is, there are more on the right side of the estimated average vertical line. So that there is publication bias, the research bias tends to overestimate the true effect (overestimate).

DISCUSSION

Telemedicine can be defined more simply as the application of information and communication technology to provide health services remotely without the need for direct contact with patients (Siegel, 2017). Telemedicine has also been proven to provide effective treatment for various diseases. Telemedicine and direct care are equally effective and achieve high levels of satisfaction among patients and healthcare providers (Ritcher, 2015). Based on the results of a meta-analysis of 9 articles, telemedicine is effective for improving self-care in heart failure patients, and it is statistically significant. Heart failure patients who received telemedicine-based education had an average self-care value of 0.33 SMD units higher than those who did not receive the intervention (SMD= 0.33; 95% CI= 0.15 to 0.52; p= 0.004).

Several studies have shown the effectiveness of telemedicine for self-care in heart failure patients, one of which is Seto et al. (2012) with the title "Mobile Phone-Based Telemonitoring for Heart Failure Management: A Randomized Controlled Trial", with a total of 50 people in the intervention group and 50 people in the intervention group, with a total of 100 people. The intervention group (telemonitoring) was asked to use the telemonitoring system for 6 months to measure body weight in the morning, measure blood pressure, report symptoms via cell phone. Both patients and doctors can view physiological data on a secure website in table and graphic formats. All data can also be accessed via cellphone. If a patient does not take all measurements by 10am, they will be given a reminder in the

form of a phone call to their home phone. This intervention is effective for improving self-care in heart failure patients from a cell phone-based telemonitoring system.

In one of the studies by Clays et al. (2021), with a total of 34 people in the intervention group and 22 people in the control group with a total of 56 people involved in this research. Patients in the intervention group received usual care (clinical guidelines provided by cardiologists, general practitioners and nurses) in addition to using the health system, namely HeartMan. The intervention was initiated during a home visit by members of the research team providing all necessary equipment, technical installation and instructions for use. Test equipment in the form of blood pressure devices, weight scales, and special bracelet sensors to record heartbeats, thermometers, and galvanic skin response (GVR) to assess psychological changes in the skin resulting from changes in sweat gland activity, where the glands will be active when the body is under stress or under stress. Intervention patients use the HeartMan system for a period of 3 to 6 months. The use of the HeartMan system shows an increase in self-care for heart failure patients.

Another study by Dorsch et al. (2021), with a total of 42 people in the intervention group and 41 people in the control group with a total of 83 people. The intervention group used a mobile application, namely ManageHFLife, this application is in the form of daily self-monitoring, providing indicators to promote self-management, physical activity (Fibit scale) and standard information about heart failure. All participants were given a 30-minute educational session on how to use the application. Every 9 am the patient is required to fill out a survey of 8 questions in the application, if the patient has not completed the survey by 12 noon there will be a reminder notification. There are 3 health status indicators in this application, namely green, yellow and red. The green color is defined as stable, while the yellow and red colors represent a worsening clinical condition. Application interventions that focus on promoting self-care have been shown to be effective in heart failure patients.

According to Athilingam et al. (2017), with a total of 9 participants in the intervention group and 9 participants in the control group with a total of 18 participants with heart failure heart. The intervention group will receive some of the features of the HeartMapp application from their Android phone. HeartMapp features provided to participants include audio interactive teaching tools about heart failure, the importance of a low salt diet, exercise regimens, treatment of heart failure, how to manage the disease and feelings. Participants were asked to use HeartMapp daily from home for 4 weeks. The results of the study show that the use of the HeartMapp application can improve self-care in heart failure patients.

Based on research by Evangelista et al. (2015), as many as 42 people were involved in this study. The nurse showed the patients in the intervention group how to use the Remote Monitoring System (RMS) platform and instructed them to measure their weight, heart rate and blood pressure every day for 3 months. RMS equipment will be delivered to patients 24 hours after they are discharged. Nurses contact each patient 24 to 48 hours after discharge to ensure that the patient has received the device. The RMS device will provide warning and feedback if something is not right or if the vital signs are outside the set limits. Nurses will communicate with patients via teleconference and collaborate with other health workers to facilitate follow-up action. The use of RMS has proven to be feasible and effective in improving self-care in heart failure patients.

The results showed the effectiveness of telemedicine to improve self-care in heart

failure patients and it was statistically significant. The existence of remote monitoring can improve self-care in heart failure patients, because patients are continuously monitored by health workers so as to encourage patients to manage their disease properly. Remote monitoring can also influence symptoms, communication with therapists and motivation to maintain and improve self-care in heart failure patients. This allows patients who live in remote areas with less facilities to be able to use telemedicine and connect to the medical system. Telemedicine can be a channel for health care providers to communicate with patients and can facilitate question and answer sessions between patients and health workers.

AUTHOR CONTRIBUTION

Audria Ersananda is the main researcher in this study who selects topics, searches for and collects research data. Hanung Prasetya and Burhannudin Ichsan analyzed the data and provided input throughout the research process to the end..

CONFLICT OF INTEREST

There was no conflict of interest in the study.

FUNDING AND SPONSORSHIP

This study is self-funded.

ACKNOWLEDGEMENT

We thank the database providers Google Scholar, PubMed, and the Cochrane Library.

REFERENCE

Alfridsyah H, Iskandar (2017). Faktor risiko terjadinya penyakit jantung koroner pada pasien rumah sakit umum meuraxa banda Aceh. Aceh Nutr J, 2(1): 32–42. https://doi.org/10.30867-/action.v2i1.34

Athilingam P, Jenkins B, Johansson M (2017). A mobile health intervention to improve self-care in patients with heart failure: pilot randomized control trial. Cardio.Jmir.Org, 1(2):1-14. https://doi.org/10.2196/cardio.7848

Bashi N, Windsor C, Douglas C (2016). Evaluating a web-based self-management intervention in heart failure patients: a pilot study. JMIR Res Protoc, 5(2): 1-10. https://doi.org/10.-2196/resprot.5093

Bekelman DB, Plomondon ME, Carey EP, Sullivan MD, Nelson KM, Hattler B, McBryde CF., et al (2015). Primary results of the patient-centered disease management (pcdm) for heart failure study a randomized clinical trial. JAMA Intern Medi, 175(5):725–732. https://doi.org/10.1001/jaainternmed.2015.0315

Chen C, Li X, Sun L, Cao S, Kang Y, Hong L, LiangY., et al (2019). Post-discharge short message service improves short-term clinical outcome and self-care behaviour in chronic heart failure. ESC Hear Fail, 6(1):164–173. https://doi-.org/10.1002/ehf.12380

Clays E, Puddu PE, Lustrek M, Pioggia G, Derboven J, Vrana M, De Sutter J., et al (2021). Proof-of-concept trial results of the heartMan mobile personal health system for self-management in congestive heart failure. Sci Rep, 11(1): 1–10. https://doi.org/10.1038/s41598-021-84921-4

Corwin (2010). Buku Saku Patofisiologi. EGC.

Creber R, Patey M, Dickson V (2015). Motivational interviewing tailored interventions for heart failure (MITI-HF): study design and methods. Elsevier, 41(1): 62-68. https://doi.org/10.1016/j.cct.2014.12.019

Culha I, Kosgeroglu N, Bolluk O (2016). Effectiveness of self care education on patients with stomas. IOSR J Nurs Heal

Sci, 1(2): 3–6. https://doi.org/10.979-0/195905217076

Dachi RA. (2017). Proses dan analisis kebijakan kesehatan (suatu pendekatan konseptual) (Health policy processes and analysis (a conceptual approach). Deepublish.

Dewi R, Rahardjo S, Behavior BMHP (2019). Path analysis on the factors affecting the use of personal protection equipment among airport construction workers in Yogyakarta. Core.Ac.Uk, 4(1): 12–21. https://doi.org/10.2691-1/thejhpb.2019.04.01.02

Dobke M, Bhavsar D, Herrera F (2011). Do telemedicine wound care specialist consults meet the needs of the referring physician? A survey of primary care providers. Int J Telemed Appl, 11 (1): 1-6. https://doi.org/10.1155/2011/3213-76

Dorsch MP, Farris KB, Rowell BE, Hummel SL, Koelling TM (2021). The effects of the managehf4life mobile app on patients with chronic heart failure: randomized controlled trial. JMIR MHealth UHealth, 9(12): 1-10. https://doi.org/10.2196/26185

Evangelista LS, Lee JA, Moore AA, Motie M, Ghasemzadeh H, Sarrafzadeh M, Mangione CM. (2015). Examining the effects of remote monitoring systems on activation, self-care, and quality of life in older patients with chronic heart failure. J Cardiovasc Nurs, 30(1): 51–57. https://doi.org/10.1097/JCN.000-0000000000110

Heriansyah T. (2019). Gagal jantung (Heart Failure). UB Press.

Husnaniyah D, Riyanto, Kamsari. (2022). Buku ajar keperawatan keluarga. Deepublish.

Irwan. (2016). Epidemiologi Penyakit Tidak Menular. Deepublish.

Janssen-Boyne JJ, Vrijhoef HJM, Spreeuwenberg M, De Weerd G, Kragten J, Gorgels APM (2014). Effects of tailored telemonitoring on heart failure patients' knowledge, self-care, self-efficacy and adherence: A randomized controlled trial. Eur J Cardiovasc Nurs, 13(3): 243–252. https://doi.org/10.1-177/1474515113487464

Kasron (2012). Kelainan dan penyakit jantung pencegahan serta pengobatannya (Disorders and heart disease prevention and treatment). Nuha Medika.

Kuntardjo C (2020). Dimensions of ethics and telemedicine in indonesia: enough of permenkes number 20 year 2019 as a frame of telemedicine practices in indonesia. J Huk Kesehat, 6(1): 1-14. http://dx.doi.org/10.24167/shk.v6i1.2606

Laksono S, Achadi A, Halomoan R (2021). Systematic review: telemedicine dalam manajemen pasien gagal jantung semasa pandemi. J Kesehat Vokasional, 6(2):130.http://dx.doi.org/10.22146/jkesvo.62300

Maulana M (2023). Meta-analysis of the effect of internet-based self-management on blood glucose control in type 2 diabetes melitus patient. JHPM, 8(2): 86-95. https://doi.org/10.26911/the-jhpm.2023.08.02.02

Mulyati L, Yeti K, Sukamrini L (2014). Analisis faktor yang mempengaruhi self management behaviour pada pasien hipertensi. J Keperawatan Padjajaran, 1: 12–23. https://dx.doi.org/10.2419-8/jkp.v1i2.59

Muller KI (2017). Headache patients satisfaction with telemedicine:A 12-month follow-up randomized non-inferiority trial 1-9. Eur J Neurol. 24(6):807-815. https://doi.org/10.111-1/ene.13294

Murti B (2018). Prinsip dan Metode Riset Epidemiologi (Edisi V). Bintang Fajar Offset.

Negarandeh R., Zolfaghari M (2019). Evaluating the effect of monitoring through telephone (tele-monitoring) on self-care behaviors and readmission of patients with heart failure after discharge. Thieme-Connect.Com, 10-(2): 261-268. https://doi.org/10.105-5/s00391685167

Nurhayati, Andari FN, Fredrika L. (2020). Penatalaksanaan Gagal Jantung. KHD Production.

Piette JD, Striplin D, Marinec N, Chen J, Trivedi RB, Aron DC, Fisher L., et al (2015). A mobile health intervention supporting heart failure patients and their informal caregivers: A randomized comparative effectiveness trial. J Med Internet Res, 17(6):1-18. https://doi.org/10.2196/jmir.4550

Rabbe S, Blankart CR, Franz W, Hager L, Schreyogg J (2021). Impact of a telemonitoring intervention in patients with chronic heart failure in Germany: A difference-in-difference matching approach using real world data. J Telemed Telecare, 29(5): 365-373. Https://doi.org/10.1177/1357633x20984024

Rahma, ASN (2023). Meta analysis the effect of electronic health-based self management in controlling blood pressure in hipertensive patients. JHPM,8(2):105-118. https://doi.org/10.26911/thejhpm.2023.08.02.04

Rahmawati R, Bajorek B (2018). Factors affecting self-reported medication adherence and hypertension knowledge: a cross sectional study in rural villages, yogyakarta province, indonesia. Chronic Illn, 14(3): 212–227. https://doi.org/10.1177/1742395317739092

Richter KP, Shireman T, Ellerbeck EF, Cupertino AP, Catley D, Preacher KJ, Spaulding R., et al (2015). Comparative and cost effectiveness of telemedicine versus telephone counseling for smoking cessation. JMIR Publications, 17-(5):113-120. https://doi.org/10.2196-/jmir.3975

Sari YK, Tanjung S (2022). Meta Analisis Terhadap Pengaruh Pembelajaran Inkuiri (Meta-Analysis of the Influence of Inquiry Learning). EDU Publisher.

Setiawan, Ridwan (2016). Teori dan Praktek Keperawatan Keluarga. Unnes Press.

Seto E, Leonard KJ, Cafazzo JA, Barnsley J, Masino C, Ross HJ (2012). Mobile phone-based telemonitoring for heart failure management: A randomized controlled trial. J Med Internet Res, 14(1): 1–14. https://doi.org/10.2196/jmir.1909

Setyono A, Alam MJ, Eswaran C (2012). The development and implementation of a multimedia messaging service for an enhanced mobile telemedicine system. Int J Healthc Inf Syst and Informatics, 7(1): 13–30. http://dx.doi.org/10.4018/jhisi.2012010102

Siegel CA (2017). Transforming gastroenterology care with telemedicine. J Gastro, 152(5): 958-963. https://doi.org/10.1053/j.gastro.2017.01.048

Toback M, Clark N (2017). Strategies to improve self-management in heart failure patients. Contempary Nurse, 53(1): 105–120. https://doi.org/10.1080/10376178.2017.1290537

Umiati S (2021). Effectiveness of telemedicine on patient satisfaction:meta analysis. JHPM, 6(1):48-56. https://doi.org?10.26911/thejhpm.2021.06.01.05

Wijaya AS, Putri YM. (2013). Keperawatan Medical Bedah; Teori Dan Contoh Askep. Nuha Medika.

Yu DSF, Li PWC, Li SX, Smith RD, Yue SCS, Yan BPY. (2022). Effectiveness and cost-effectiveness of an empowerment-based self-care education program on health outcomes among patients with heart failure: a randomized clinical trial. JAMA Netw Open, 5(4):1-13. http://dx.doi.org/10.1001/jamanetworkopen.2022.59