Development of Health Promotion with The Design of Heart Failure Patient Monitoring Instrument

Alfan Al Ghifari Sudarmanto[1*], Mahendro Prasetyo Kusumo[1]

[1] Master in Hospital Administration, Universitas Muhammadiyah Yogyakarta, Kampus Terpadu UMY, Gedung Pascasarjana Yogyakarta, Yogyakarta, Indonesia

Abstract: Heart disease, particularly heart failure, is a prevalent chronic condition requiring regular monitoring to maintain patients' well-being. This study aims to develop and validate a monitoring instrument for heart failure patients. A pilot study was conducted in two main stages: instrument development and pre-test post-test on a sample of outpatient heart failure patients at RSU Muhammadiyah Ponorogo from March to May 2023. The validity test revealed 17 valid questionnaire items, with Cronbach's Alpha values for routine examination, physical activity, and nutrition domains being 0.729, 0.829, and 0.786, respectively, indicating good reliability. Sample testing demonstrated a significant improvement in patient compliance ($p < 0.005$) and nutritional status ($p < 0.05$) after cardiovascular health promotion. However, there was no significant change in physical activity. With a combination of high construct validity, good reliability, and strong content validity, the questionnaire proved to be a robust and reliable measurement tool. The findings depict significant changes in compliance and nutritional status among heart failure patients following health promotion interventions, emphasizing the need for further focus on physical activity aspects. These results can contribute to the development of more effective monitoring and care strategies for heart failure patients.

Keywords: Compliance; Heart failure; Nutrition; Physical activity

Introduction

The World Health Organization (WHO) has defined chronic diseases as diseases that cannot be transmitted from one person to another. Chronic diseases often last a long time. Over the past decades, the number of chronic diseases has increased significantly. It has become one of the reasons why people have to live with limitations for many years, and its incidence increases with age (Reynolds et al., 2018). On the other hand, WHO data shows that chronic diseases cause the deaths of 41 million people every year, and this number accounts for about 71% of all deaths worldwide. Chronic illness causes individuals to live with limitations in their activities. These restrictions could weigh heavily on economic systems and health services. The economic system is burdened by large numbers of unproductive workers, and the health service system is burdened by large numbers of patients. In preventing chronic diseases like this, it is important to know the patient's knowledge, attitudes and behavior in dealing with the disease in everyday life. Heart disease is one of the most common chronic diseases. Heart disease accounts for 365 million cases and 17.90 million deaths each year (Virani et al., 2021). Heart disease causes $320 billion in lost productivity worldwide. This number is expected to increase by 2030, with annual healthcare costs of $818 billion and lost productivity of $275 billion (Giedrimiene & King, 2017).

Heart failure is an example of a chronic disease common in society. Heart failure is a series of heart symptoms in which the heart cannot pump enough blood to meet the body's needs and demands (Malik et al., 2021). People with heart failure often complain of constant fatigue and shortness of breath while in a health care facility. Impairment in the ability to participate in

activities and swelling in various parts of the patient and body were also observed (Hajouli & Ludhwani, 2021). Even, in severe cases, heart failure pasien had to be admitted to intensive care due to the patient's condition (Purnamayanti et al., 2023). Heart failure can be prevented by adopting a healthy lifestyle, maintaining a healthy weight, not smoking, exercising regularly, and eating healthy foods (Butler, 2012).

Health promotion and regular monitoring are the best ways to monitor heart failure patients. In fact, health promotion in heart failure patients mainly focuses on lifestyle changes, dietary changes, smoking cessation, alcohol consumption, and medication (Stewart et al., 2017). In the other hand, development in management of heart failure is also at its finest, therefore there are several new medication that can be used to manage heart failure (Pintaningrum & Pranayoga, 2023). When we talked about medication, in heart failure patient, its important as well to take care of the heart rate, therefore, it's important for the patient to monitor their heart (Vidiastuti & Arfiati, 2023). While controlling heart rate for heart failure patient is a must, patient still don't know much about the types of food that they need to manage their disease. There are several food that they need to avoid, and there are several food that they need to add (Budiyanto et al., 2021). In the other hand, patient with heart disease also vulnerable to get some infection. Antioxidant is one of the way to prevent this from happening (Lukman et al., 2023). It is essential to know the patient's level of medical knowledge.

Previous studies explain that the reading of heart failure patients statistically shows a significant effect and is one of the predictors of the patient's quality of life. Factors such as high body mass index, high systolic blood pressure, and low economic status are also significantly associated with illness perceptions of patients and caregivers (Jovanić et al., 2018). Risks such as arrhythmia, hypertension, and coronary heart disease are factors that can lead to heart failure (Chamberlain et al., 2020). Heart failure patients face many different challenges in managing the disease. The desire to improve the patient's condition is very important in the treatment of heart failure. The patient's lack of motivation is reflected in the ineffectiveness of the care provided. Modification of physical activity, dietary management, time planning, medication compliance, and cessation of smoking and alcohol consumption will not be effective without the patient's strong will. Optimal self-care in heart failure requires knowledge, skills, confidence, and motivation to undertake all available treatments. The decline in patient motivation is due to many deaths. Depression and cognitive impairment also reduce patients' motivation to recover and their health (Riegel et al., 2017). Health promotion in

hospitals applies not only to patients but also to health care providers working in hospitals. The increase in the number of patients with chronic diseases also increases the psychological pressure on medical service providers in hospitals. Hospital management needs to be able to develop a health promotion plan so that health promotion for patients and everyone in the hospital environment goes smoothly.

To reduce the workload of hospital care providers, this development is also associated with healthy work environments (Yaghoubi et al., 2016). In today's digital age, promoting health through mobile applications is very important. Health podcasts, mobile information apps, mobile analog radio, and other media are some of the ways health promotion activities are disseminated (Balls-Berry et al., 2018). Initiatives created specifically for the health sector can also help promote health. Nowadays, one can find applications that provide the latest health information, medical examinations, and remote consultations (Octavius & Antonio, 2021). Health can also be promoted through social media sites such as WeChat, WhatsApp, Facebook, Instagram, Twitter and Telegram. To help healthcare providers improve their facilities, social networks are used to exchange information and experiences between patients and providers (Brody et al., 2020).

The current questions are interesting and encourage researchers to investigate the effectiveness of family-based health promotion in hospitalized heart failure patients. The significance of this research cannot be overlooked, considering the increasing prevalence of chronic diseases, especially heart diseases, which have become a substantial burden on the global population. Firstly, based on data from the World Health Organization (WHO), chronic diseases account for 71% of total deaths worldwide, with 41 million deaths annually. This situation indicates a concerning escalation and emphasizes the urgency to understand and manage chronic diseases, including heart failure.

Furthermore, the economic impact of chronic diseases, particularly heart diseases, is highly significant. Heart failure alone causes 365 million cases and 17.90 million deaths each year, with a global productivity loss of $320 billion. Future projections also indicate a substantial increase in healthcare costs and productivity losses. Therefore, this research becomes crucial to identify effective strategies in the management and prevention of heart failure. Moreover, the focus of this research on health promotion and regular monitoring as the best methods to monitor heart failure patients is highly relevant. With the increasing number of chronic patients, especially those facing heart failure, understanding and implementing proper health

practices become key to improving the quality of life and reducing the burden on healthcare systems.

Lastly, this research also makes a significant contribution in the context of innovative development. By integrating mobile applications and digital media, this research explores new ways to deliver health information and health promotion. In an increasingly connected world, this approach could open doors to positive changes in the management and monitoring of chronic diseases, bringing positive impacts not only to patients but also to healthcare providers and the overall healthcare system. Considering the urgency of global health issues and the potential positive contributions that this research can make in addressing heart failure, this study becomes essential as a significant step in efforts to enhance the overall well-being of the community.

Method

The research design used in this research is quantitative. The author conducted a comprehensive literature review using various search engines and specific keywords related to heart failure. This research utilizes the pilot study research method with a three-stage design. The first stage involves developing a research instrument, and the second stage tests the instrument on the research sample, and then to test the questionnaire while giving health promotion. The instrument development includes a literature review and expert corrections, followed by validation to ensure its validity and reliability. The validity test of the questionnaire yielded 17 valid questions. In March and April 2023, a validation and reliability assessment of the questionnaire concerning medication adherence, nutrition, and physical activity was carried out on a sample of 31 patients at Muhammadiyah Ponorogo Hospital.

The Cronbach's Alpha test results for the questionnaire, encompassing routine examination, physical activity, and nutrition domains, demonstrated alpha values of 0.72, 0.82, and 0.78, respectively, all exceeding the critical value of 0.60. Therefore, the questionnaire can be considered both valid and reliable. The next step is to implement the questionnaire to 31

heart failure patients in outpatient clinic of Ponorogo Muhammadiyah Hospital. The questionnaire is used as both pretest and posttest while in between the authors are giving the patients' health promotion in WhatsApp group. This research commenced with an initial stage of an in-depth literature review by the researcher. In this phase, the author conducted a thorough search using various search engines and specific keywords related to heart failure. The primary objective of the literature review was to comprehend the current knowledge regarding the management and health promotion for heart failure patients.

Following the literature review, the research progressed to the development of the research instrument, namely a questionnaire covering the domains of routine examination, physical activity, and nutrition. The formation of the questionnaire involved a correction and validation process by experts in the field. The next step was the piloting phase, where the questionnaire was tested on a small sample to evaluate its effectiveness and obtain initial feedback. Subsequently, the validation and reliability testing of the questionnaire were conducted involving a sample of 31 patients at Muhammadiyah Ponorogo Hospital, focusing on the domains of medication adherence, nutrition, and physical activity.

Data analysis was carried out using Cronbach's Alpha to assess the reliability of the questionnaire in each domain. The results of this analysis were used to ensure that the questionnaire had an adequate level of validity and reliability. Furthermore, the questionnaire was implemented on 31 heart failure patients at the outpatient clinic of Muhammadiyah Ponorogo Hospital as both a pretest and posttest. Between the two tests, the author provided health promotion through a WhatsApp group as an intervention. The analysis of results was conducted by comparing pretest and posttest data to evaluate the impact of health promotion on medication adherence, nutrition, and physical activity among patients. Finally, the research concluded with the presentation of findings based on the data analysis, discussing the implications of the results for the monitoring and management of heart failure patients. Recommendations were provided as guidance for further development and improvements in health promotion for heart failure patients.
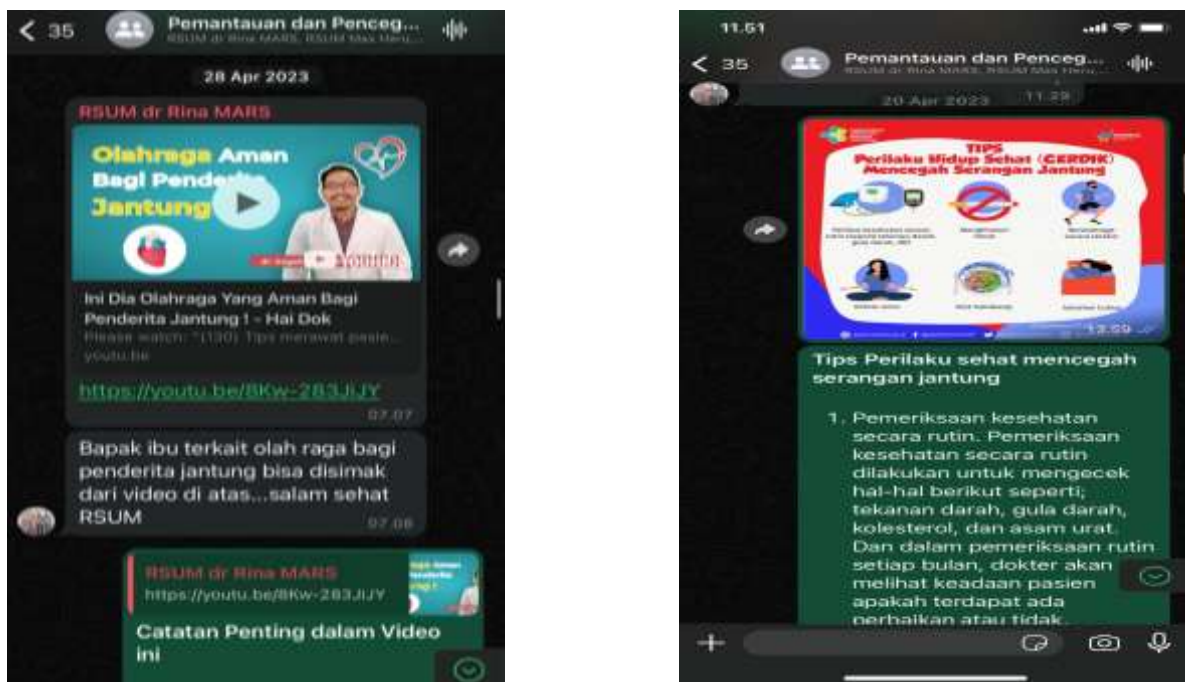
Figure 1. Data Collecting Process

Figure 2. Health Promotion Group

Result and Discussion

Results

The majority of respondents in this study are in the 41-60 age range (50%), followed by the 61-80 age group (33.33%), and the 20-40 age group (16.67%). Females make up the majority, accounting for 67.70%, while males represent 32.30% of the respondents. The predominant occupations are housewifes (41.90%) and farmers (35.50%), with other professions like maid, paramedic, private employee, nurse, and retiree each constituting a small percentage (around 3.20%), and private employees at 6.50%. The majority of respondents are married (87.10%), and divorced or widowed individuals each have the same percentage (6.50%). Regarding educational attainment, most respondents

have a high school education (45.20%), followed by elementary school (29%), college (12.90%), and junior high school (12.90%). Overall, this summary provides a comprehensive overview of the characteristics of the respondents in the study.

Table 1. The characteristics of the respondents

Variable	Frequency (f)	Percentage (%)
Age		
20-40 years	6	16.67
41-60 years old	15	50
61-80 years old	10	33.33
Gender		
Male	10	32.30
Female	21	67.70
Occupation		
Maid	1	3.20
Housewife	13	41.90
Paramedic	1	3.20
Private employees	1	3.20
Nurse	1	3.20
Entrepreneur	1	3.20
Privat	2	6.50
Farmer	11	35.50
Marital status		
Divorced	2	6.50
Widow	2	6.50
Married	27	87.10
Previouos Education		
College	4	12.90
Elementary school	9	29.00
Senior High School	14	45.20
Junior High School	4	12.90

Validity Test

Table 2. Content Validity Test Results

Item No	Panel 1 Sp. GK	Panel 2 Sp. JP	Panel 3 FISPH	Number of Agreements	i-CVI	Information
Item 1	1	1	1	3	1.00	Valid
Item 2	1	1	1	3	1.00	Valid
Item 3	1	1	1	3	1.00	Valid
Item 4	1	0	1	2	0.67	Invalid
Item 5	1	0	1	2	0.67	Invalid
Item 6	1	1	1	3	1.00	Valid
Item 7	1	1	1	3	1.00	Valid
Item 8	1	1	1	3	1.00	Valid
Item 9	1	1	1	3	1.00	Valid
Item 10	1	1	1	3	1.00	Valid
Item 11	1	1	1	3	1.00	Valid
Item 12	1	1	1	3	1.00	Valid
Item 13	1	1	1	3	1.00	Valid
Item 14	1	1	1	3	1.00	Valid
Item 15	1	0	1	2	0.67	Invalid
Item 16	1	1	1	3	1.00	Valid
Item 17	1	1	1	3	1.00	Valid
Item 18	1	1	1	3	1.00	Valid
Item 19	1	1	1	3	1.00	Valid
Item 20	1	0	1	2	0.67	Invalid
Item 21	1	0	1	2	0.67	Invalid
Item 22	1	1	1	3	1.00	Valid
Item 23	1	1	0	2	0.67	Invalid
S-CVI					0.91	

Items 1 to 22 received a perfect i-CVI value of 1.00, signifying unanimous agreement among all three expert panels, demonstrating their validity and relevance. However, items 4, 5, 15, 20, 21, and 23 had an i-CVI value of 0.67, indicating a slight difference of opinion among the expert panel, suggesting a lack of validity for these items. A total of 18 items were unanimously declared valid by all expert panels. The Scale Content Validity Index (S-CVI) value, which is the average of all i-CVI values, is 0.91, indicating a high overall content validity level for the questionnaire. Consequently, based on CVI calculations, the questionnaire can be considered valid in terms of content.

Construct Validity Test Result

Table 3. Results of the Construct Validity Test

Question Domain	Items	r count	r table N:31	Information
Routine	X1.1	0.85	0.36	Valid
Check-up	X1.2	0.74	0.36	Valid
	X1.3	0.85	0.36	Valid
Physical	X2.1	0.62	0.36	Valid
Activity	X2.2	0.73	0.36	Valid
	X2.3	0.61	0.36	Valid
Nutrition	X3.1	0.45	0.36	Valid
	X3.2	0.74	0.36	Valid
	X3.3	0.72	0.36	Valid
	X3.4	0.58	0.36	Valid
	X3.5	0.66	0.36	Valid
	X3.6	0.63	0.36	Valid
	X3.7	0.51	0.36	Valid
	X3.8	0.37	0.36	Valid
	X3.9	0.63	0.36	Valid
	X3.10	0.57	0.36	Valid
	X3.11	0.55	0.36	Valid

The construct validity test results on the table affirm the effectiveness of the measurement of concepts across different question domains. In the "Routine Check-up" domain, all tested items (X1.1, X1.2, X1.3) demonstrate a significant correlation with the "Routine Examination" concept, surpassing the specified values with calculated correlations of 0.85, 0.74, and 0.85, respectively. This suggests the validity of these items in measuring aspects related to routine check-up.

Additionally, in the "Physical Activity" domain, all items (X2.1, X2.2, X2.3) exhibit significant correlation values with the "Physical Activity" concept, surpassing the designated values with correlations of 0.62, 0.73, and 0.61, respectively. Consequently, it can be inferred that these items effectively measure the investigated physical activity. Lastly, within the "Nutrition" domain, all items (X3.1 to X3.10) demonstrate correlation values higher than the specified values, signifying the valid measurement of the "Nutrition" concept. These results lead to the conclusion that the measurement instrument used in this study exhibits good construct validity in assessing the aspects within each question domain.

Reliability Test Result

Table 4. Reliablity Test Results

Variable	Cronbach Alpha	Critical Value	Information
Routine Checkup	0.72	0.60	reliable
Physical Activity	0.82	0.60	reliable
Nutrition	0.78	0.60	reliable

The reliability test results for various variables in the study are presented in the table. Firstly, the "Routine Examination" variable exhibits a Cronbach's Alpha value of 0.72, surpassing the critical threshold of 0.60. This implies that the measuring instrument used for assessing the "Routine Checkup" concept is reliable, indicating good consistency. Similarly, the "Physical Activity" and "Nutrition" variables also demonstrate strong reliability with Cronbach's Alpha values of 0.82 and 0.78, respectively, both exceeding the critical value of 0.60. Consequently, the measuring instruments for these variables can be considered reliable in capturing the relevant concepts in this study.

Pretest and Posttest Results

Table 5 displays the frequency distribution for both the Pretest and Post Test across three domains: Compliance, Physical Activity, and Nutrition. These data are likely utilized to assess changes before and after an intervention. Before the intervention, only 22.60% of participants exhibited good compliance, increasing significantly to 96.80% in the post-test. This points to a notable enhancement in compliance levels following the intervention, indicating a shift from low to good compliance. In the pretest, 77.40% demonstrated a good level of physical activity, with 22.60% having a low level. Post-intervention, these proportions remained unchanged at 77.40% and 22.60%, respectively, suggesting no significant alteration in physical activity

levels. Before the intervention, 74.20% displayed good nutrition, while 25.80% had a low level. After the intervention, 96.80% showed good nutrition, and only 3.20% had a low level. This indicates a substantial increase in achieving good nutrition levels post-intervention. In summary, the intervention appears highly effective in enhancing participants' compliance and nutrition. However, concerning physical activity, the majority sustained a good level both before and after the intervention.

Table 5. Pretest and Posttest Data Results

Variable	Pretest Data		Posttest Data	
	Frequency (f)	Percentage (%)	Frequency (f)	Percentage (%)
Routine Checkup Compliance Domain				
Good	24	77.40	30	96.80
Not enough	7	22.60	1	3.20
Physical activity domain				
Good	24	77.40	24	77.40
Not enough	7	22.60	7	22.60
Nutrition Domain				
Good	23	74.20	30	96.80
Not enough	8	25.80	1	3.20

Comparison of patient's adherence before and after the intervention

Table 6. Patient's adherence before and after intervention

		Mean	Std. Deviation	Std. Error Mean	Sig. (2-tailed)
Pair 1	Compliance before	2.03	0.98	0.17	
	Compliance after	2.90	0.39	0.07	0.00

Table above compares adherence levels in heart patients before and after receiving a questionnaire. Initially, average patient compliance was around 2.03, with a standard deviation of 0.98 and a standard error of the mean of 0.17. After the questionnaire, average compliance increased to 2.90, with a reduced standard deviation of approximately 0.39 and a standard error of the mean of 0.07. Statistical analysis revealed a significant difference in compliance levels before and after the questionnaire (p-value = 0.00), indicating a positive impact on enhancing heart patients' adherence.

Comparison of patient's physical activity before and after the intervention

Table 7. Patient's physical activity before and after intervention

Physical Activity		Mean	Std. Deviation	Std. Error Mean	Sig. (2-tailed)
Pair 1	Before	2.03	0.98	0.17	
	After	2.29	0.90	0.16	0.28

Table 5 compares the physical activity levels of heart patients before and after a questionnaire. Prior to the questionnaire, the average activity was about 2.03, with a standard deviation of approximately 0.98 and a standard error of the mean of about 0.17. After the questionnaire, the average activity increased to about 2.29, with a standard deviation of around 0.90 and a standard error of the mean of about 0.16.

The statistical analysis, with a p-value of approximately 0.28, indicates that the difference in physical activity levels before and after the questionnaire is not statistically significant (p-value > α = 0.05). In summary, the questionnaire did not have a noteworthy impact on increasing the physical activity of heart patients, as reflected in the statistically insignificant difference in average levels before and after the questionnaire.

Comparison of patient's nutrition before and after the intervention

Table 8. Patient's nutrition before and after intervention

Nutrition		Mean	Std. Deviation	Std. Error Mean	Sig. (2-tailed)
Pair 1	Before	7.70	2.64	0.47	
	After	9.03	1.83	0.32	0.02

Table above compares the nutritional levels of heart patients before and after a questionnaire. Initially, the average nutritional level was around 7.70, with a standard deviation of approximately 2.64 and a standard error of the mean of about 0.47. After the questionnaire, the average nutritional level increased to about 9.03, with a standard deviation of approximately 1.83 and a standard error of the mean of about 0.32.

Statistical analysis indicates a significant difference between nutritional levels before and after the questionnaire, with a p-value of approximately 0.02, surpassing the commonly used significance level of α = 0.05. In summary, the questionnaire has a notable impact on improving the nutritional levels of heart patients, reflected in the significant difference in average levels before and after the questionnaire. This suggests that

heart patients tend to exhibit better nutritional levels post-questionnaire, potentially indicating positive changes in their dietary habits or increased awareness of improved nutrition.

The content validity assessment using CVI involved expert panels evaluating questionnaire items. Key findings include unanimous agreement among the panels (i-CVI of 1.00) for items 1 to 22, indicating their validity and relevance. Despite some divergence (i-CVI of 0.67) for items 4, 5, 15, 20, 21, and 23, they are considered acceptably valid, with room for improvement. Total agreement for 18 items and an S-CVI of 0.91 indicate a high overall content validity level for the questionnaire, instilling confidence in its ability to accurately measure relevant research concepts.

The questionnaire proves to be a robust and reliable tool for collecting high-quality research data, characterized by a combination of construct validity, high reliability, and strong content validity based on CVI. The heightened content validity ensures that the questionnaire items effectively represent the intended concepts and align with the research objectives. The development of research instruments is a crucial phase for assessing variables relevant to research goals, with construct validity and reliability being key components. The construct validity test results, illustrated in Table 3, validate the instrument's accuracy in measuring concepts across various question domains. Specifically, in the "Routine Checkup" domain, all items (X1.1, X1.2, X1.3) show a significant correlation with the "Routine Checkup" concept, surpassing the critical r-value, indicating their effectiveness in capturing aspects related to routine checkups. Similarly, positive outcomes in the "Physical Activity" and "Nutrition" domains affirm the satisfactory validity of the measurement tool in assessing relevant concepts in each respective domain.

In the reliability test, it establishes that the instruments employed in this study are dependable. Notably, for variables such as Routine Checkup, the Cronbach's Alpha value of 0.72 surpasses the critical threshold of 0.60, indicating consistent evaluation of the concept and reliability. A comparable reliability is observed for the Physical Activity and Nutrition variables, where Cronbach's Alpha values exceed the critical thresholds, affirming the trustworthiness of the measuring tool in assessing the investigated concepts.

In summary, positive outcomes in construct validity and reliability confirm the credibility and consistency of the instruments used in the study, providing a solid foundation for reliable data analysis. To recap, an examination of frequency distribution reveals significant changes in two out of the three observed domains. Specifically, the Compliance Domain sees a substantial increase in compliance levels post-intervention, from 22.60% in the pre-test to 96.80% in the post-test. Similarly, the Nutrition Domain shows a significant improvement in good nutrition levels after the intervention, increasing from 74.20% to 96.80%. However, in the Physical Activity Domain, there are no notable changes between the pre-test and post-test, with the majority of participants maintaining satisfactory physical activity levels. While the intervention proves effective in boosting compliance and nutrition levels, it doesn't significantly impact participants' physical activity.

Turning to the comparison of heart patients' compliance levels before and after questionnaire administration, the results suggest a positive influence on increased compliance, evidenced by a significant difference in averages before and after the questionnaire. However, comparing the physical activity levels before and after the questionnaire shows no significant difference, with a p-value exceeding the commonly used significance level. Finally, in the comparison of nutrition levels among heart patients before and after the questionnaire, the findings indicate a positive impact on increased nutrition levels, supported by a significant difference in averages before and after the questionnaire, with a p-value falling below the commonly used significance level.

Discussion

From the results of the pretest and posttest data, a significant increase in routine inspection compliance was found. Increased compliance can affect the patient's health level. With active and passive communication carried out by health service providers and patients, patient compliance with treatment will be maintained (Aremu et al., 2022). In the research process, most of the patients used as research subjects were adults and elderly patients. Implementing communication groups between health care providers and patients is one way to increase patient compliance in this age level. The implementation of this communication group is a unique strategy that must be maintained in maintaining patient compliance (Panahi et al., 2022). The application of technology in chronic disease monitoring has an important role in increasing patient compliance. In line with this research, the implementation of communication media between health service providers and patients can increase patient independence in managing their illness (Wong et al., 2020).

From these explanations, this research is proven to be able to increase patient compliance with routine examinations. Talking about medication adherence, of course, will never be separated from the patient's attitude and knowledge of patient medication

management. Treatment management for heart failure patients must be complete and comprehensive management, including monitoring the patient when he is healthy, and being able to take initial steps if the patient suddenly experiences a decline in condition (Efendi et al., 2023). This is very important so it must be applied to the patient's family. The patient's family's knowledge of the patient's disease management is certainly included in health literacy, especially in helping to deal with the patient's condition. This is important, so increasing the health literacy of the patient's family must be done too (Lasminawati et al., 2022).

Physical activity is one aspect that must be considered in chronic disease management. Implementation of monitoring and socialization of recommended patient physical activity was carried out in this study. Increasing the patient's understanding of appropriate physical activity will improve the patient's situation in dealing with the disease. By implementing improvements in terms of physical activity for heart failure patients, it is hoped that patients will not only get improvements in terms of physical activity but also in terms of patient motivation (Marques-Sule et al., 2022). Knowing the right physical activity for heart failure patients is also one of the factors that helps improve the condition of heart failure patients. In this research, it is understood that the physical activity carried out is physical activity that is carried out constantly, but is not heavy, and meets the WHO standard duration of 20 minutes a day. Activities carried out include walking, cycling on flat and not uphill terrain, or gardening (Uijl et al., 2019). The quality of life of heart failure patients is also something that cannot be forgotten. By implementing appropriate physical activity, the quality of life of heart failure patients can be improved. This is indicated by an increase in the volume of oxygen that the patient can inhale, as well as an increase in the patient's quality of life (Guo et al., 2021). Doing good physical activity will also have an impact on the patient's physical condition being more satisfactory. By carrying out sufficient physical activity, it is hoped that the patient's BMI can be reduced so that other complications related to disproportionate body weight and body shape can be prevented (Asnidar et al., 2023).

Nutrition in the process of treating heart failure patients is an important thing. In heart failure patients, several restrictions are made in the patient's daily diet. Examples of these restrictions start from limiting the amount of fluid that must be drunk, then limiting the food that must be consumed by the patient. In this study, the patient received an understanding of these restrictions by the doctor responsible for treating the patient. Patient understanding in this matter certainly

varies depending on the level of education, patient education, and other factors (Billingsley et al., 2020). On the other hand, because the basic pathophysiology of the disease is almost similar, heart failure patients are often advised to take the Dietary Approaches to Stop Hypertension (DASH) diet which is also applied to hypertensive patients. Implementing a diet with this mechanism is considered to be easier for patients. With this diet, patients who previously had hypertension were able to know how to prevent heart failure properly from a nutritional perspective. On the other hand, many people who have heart disease also forget to check their fat status (Widiastuti et al., 2023).

The most important thing for heart failure patients to check their fat is to find out how much LDL fat and HDL fat there is in the patient so that they can control this fat and prevent complications in their disease. Patients who were initially worried that their hypertension would develop into heart failure now understand how to prevent it by implementing this diet (Wickman et al., 2021). Fluid restriction is an interesting topic in heart failure patients because many patients still do not understand this. In heart failure patients, fluid limitation is important to prevent fluid buildup which can lead to complications such as shortness of breath, kidney failure, etc. By providing appropriate education to patients about appropriate fluid restrictions, it is hoped that patients will no longer experience these problems (Chrysohoou et al., 2022). On the other hand, limiting the amount of salt and fat also affects the patient's blood pressure. With appropriate restrictions accompanied by sufficient physical activity, a relationship can be obtained that can improve the patient's condition which can be seen in terms of BMI and the patient's blood pressure (Imanuddin et al., 2023).

Conclusion

From the results of this research, it was found that the research instrument developed and applied in this research is a valid and reliable instrument and can be used in research. In this study, it was found that patient compliance, physical activity, and patient nutrition were the main factors in monitoring heart failure patients. If patients are given a better understanding of these factors, it is hoped that monitoring of heart failure patients will improve so that complications that arise can be prevented, and the patient's life will improve. In the future, it is hoped that similar research can be carried out with a wider range of patients and include other chronic diseases.

Author Contributions
Conceptualization, A. A. G. S., and M. P. K.; methodology, M. P. K.; validation, A. A. G. S, and M. P. K.; formal analysis, A.

A. G. S.; investigation, A. A. G. S.; resources, A. A. G. S, and M. P. K.; data curation, A. A. G. S; writing—original draft preparation, A. A. G. S, writing—review and editing, A. A. G. S.: visualization, A. A. G. S. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest
The authors declare no conflict of interest.

References

Aremu, T. O., Oluwole, O. E., Adeyinka, K. O., & Schommer, J. C. (2022). Medication Adherence and Compliance: Recipe for Improving Patient Outcomes. *Pharmacy: Journal of Pharmacy Education and Practice*, *10*(5), 106. https://doi.org/10.3390/PHARMACY10050106

Asnidar, A., Muriyati, M., Asri, A., Safruddin, S., Haerani, H., & Hamdana, H. (2023). Health Education Against Changes in Physical Activity Patterns and Body Mass Index. *Jurnal Penelitian Pendidikan IPA*, *9*(6), 4639–4646. https://doi.org/10.29303/JPPIPA.V9I6.3609

Balls-Berry, J., Sinicrope, P., Soto, M. V., Brockman, T., Bock, M., & Patten, C. (2018). Linking Podcasts with Social Media to Promote Community Health and Medical Research: Feasibility Study. *JMIR Formative Research*, *2*(2). https://doi.org/10.2196/10025

Billingsley, H. E., Hummel, S. L., & Carbone, S. (2020). The Role of Diet and Nutrition in Heart Failure: A State-of-the-Art Narrative Review. *Progress in Cardiovascular Diseases*, *63*(5), 538. https://doi.org/10.1016/J.PCAD.2020.08.004

Brody, C., Star, A., & Tran, J. (2020). Chat-Based Hotlines for Health Promotion: a Systematic Review. *MHealth*, *6*, 36–36. https://doi.org/10.21037/MHEALTH-2019-DI-13

Budiyanto, M., Mahdiannur, M. A., Sabtiawan, W. B., Nurita, T., & Sudibyo, E. (2021). Determination of Potassium Levels in Bananas Using an Optical Sensor with a Flat and Concave Mirror Plane. *Jurnal Penelitian Pendidikan IPA*, *7*(3), 293–297. https://doi.org/10.29303/JPPIPA.V7I3.703

Butler, J. (2012). Primary Prevention of Heart Failure. *ISRN Cardiology*, *2012*, 1–15. https://doi.org/10.5402/2012/982417

Chamberlain, A. M., Boyd, C. M., Manemann, S. M., Dunlay, S. M., Gerber, Y., Killian, J. M., Weston, S. A., & Roger, V. L. (2020). Risk Factors for Heart Failure in the Community: Differences by Age and Ejection Fraction. *The American Journal of Medicine*, *133*(6), e237–e248. https://doi.org/10.1016/J.AMJMED.2019.10.030

Chrysohoou, C., Mantzouranis, E., Dimitroglou, Y., Mavroudis, A., & Tsioufis, K. (2022). Fluid and Salt Balance and the Role of Nutrition in Heart Failure. *Nutrients*, *14*(7). https://doi.org/10.3390/NU14071386

Efendi, P., Buston, E., & Imamah, I. N. (2023). The Effectiveness of First Aid Education on Basic Life Support Knowledge and Skill Among Family Members with Heart Diseases. *Jurnal Penelitian Pendidikan IPA*, *9*(9), 6803–6809. https://doi.org/10.29303/JPPIPA.V9I9.4331

Giedrimiene, D., & King, R. (2017). Abstract 207: Burden of Cardiovascular Disease (CVD) on Economic Cost. Comparison of Outcomes in US and Europe. *Circulation: Cardiovascular Quality and Outcomes*, *10*(suppl_3). https://doi.org/10.1161/CIRCOUTCOMES.10.SUPPL_3.207

Guo, R., Wen, Y., Xu, Y., Jia, R., Zou, S., Lu, S., Liu, G., & Cui, K. (2021). The Impact of Exercise Training for Chronic Heart Failure Patients with Cardiac Resynchronization Therapy: A Systematic Review and Meta-Analysis. *Medicine*, *100*(13), 13. https://doi.org/10.1097/MD.0000000000025128

Hajouli, S., & Ludhwani, D. (2021). Heart Failure And Ejection Fraction. *StatPearls*. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK553115/

Imanuddin, I., Sudarsono, I. M. R., Hariani, H., & Yuningsih, P. (2023). Correlation of Sodium Intake, Body Mass and Physical Activity with Blood Pressure. *Jurnal Penelitian Pendidikan IPA*, *9*(3), 1187–1192. https://doi.org/10.29303/JPPIPA.V9I3.3087

Jovanić, M., Zdravković, M., Stanisavljević, D., & Jović Vraneš, A. (2018). Exploring the Importance of Health Literacy for the Quality of Life in Patients with Heart Failure. *International Journal of Environmental Research and Public Health*, *15*(8). https://doi.org/10.3390/ijerph15081761

Lasminawati, E., Wilujeng, I., Syamsussabri, M., & Suyanta, S. (2022). Exploration of Health Literacy in Science Learning Curriculum in Indonesia. *Jurnal Penelitian Pendidikan IPA*, *8*(4), 1882–1886. https://doi.org/10.29303/JPPIPA.V8I4.1209

Lukman, L., Ningsih, N., Eprila, E., & Sujati, N. K. (2023). Utilization of Acacia Leaves for Patients with Diabetes Mellitus, Cancer and Coronary Heart. *Jurnal Penelitian Pendidikan IPA*, *9*(7), 5547–5551. https://doi.org/10.29303/JPPIPA.V9I7.3946

Malik, A., Brito, D., Vaqar, S., & Chhabra, L. (2021). Congestive Heart Failure. *StatPearls*. Retrieved

from https://www.ncbi.nlm.nih.gov/books/NBK4308 73/

Marques-Sule, E., Deka, P., Almenar, L., Pathak, D., López-Vilella, R., & Klompstra, L. (2022). Physical Activity Readiness in Patients with Heart Failure. *International Journal of Environmental Research and Public Health*, *19*(23). https://doi.org/10.3390/IJERPH192316332

Octavius, G. S., & Antonio, F. (2021). Antecedents of Intention to Adopt Mobile Health (mHealth) Application and Its Impact on Intention to Recommend: An Evidence from Indonesian Customers. *International Journal of Telemedicine and Applications*, *2021*. https://doi.org/10.1155/2021/6698627

Panahi, S., Rathi, N., Hurley, J., Sundrud, J., Lucero, M., & Kamimura, A. (2022). Patient Adherence to Health Care Provider Recommendations and Medication among Free Clinic Patients. *Journal of Patient Experience*, *9*. https://doi.org/10.1177/23743735221077523

Pintaningrum, Y., & Pranayoga, K. (2023). Efficacy of Empagliflozin Therapy in Patient with Acute Heart Failure: Meta-analysis. *Jurnal Penelitian Pendidikan IPA*, *9*(10), 849–853. https://doi.org/10.29303/JPPIPA.V9I10.5000

Purnamayanti, N. K. D., Tondok, S. B., Susasnto, W. H. A., & Rohmani, R. (2023). Impact of Semi-Fowler's Position in Chronic Heart Failure (CHF) Patients: Scoping Review. *Jurnal Penelitian Pendidikan IPA*, *9*(11), 1229–1236. https://doi.org/10.29303/JPPIPA.V9I11.5074

Reynolds, N. A., Ski, C. F., McEvedy, S. M., Thompson, D. R., & Cameron, J. (2018). Construct Validity of the Heart Failure Screening Tool (Heart-FaST) to Identify Heart Failure Patients at Risk of Poor Self-Care: Rasch Analysis. *Journal of Advanced Nursing*, *74*(6), 1412–1422. https://doi.org/10.1111/JAN.13544

Riegel, B., Dickson, V. V., Garcia, L. E., Masterson Creber, R., & Streur, M. (2017). Mechanisms of Change in Self-Care in Adults with Heart Failure Receiving a Tailored, Motivational Interviewing Intervention. *Patient Education and Counseling*, *100*(2), 283. https://doi.org/10.1016/J.PEC.2016.08.030

Stewart, J., Manmathan, G., & Wilkinson, P. (2017). Primary Prevention of Cardiovascular Disease: A Review of Contemporary Guidance and Literature. *JRSM Cardiovascular Disease*, *6*, 204800401668721. https://doi.org/10.1177/2048040016687211

Uijl, A., Koudstaal, S., Vaartjes, I., Boer, J. M. A., Verschuren, W. M. M., van der Schouw, Y. T., Asselbergs, F. W., Hoes, A. W., & Sluijs, I. (2019). Risk for Heart Failure: The Opportunity for Prevention With the American Heart Association's Life's Simple 7. *JACC: Heart Failure*, *7*(8), 637–647. https://doi.org/10.1016/j.jchf.2019.03.009

Vidiastuti, D., & Arfiati, D. (2023). Swimming Bladder Imaging Morphometry and Potential for Reducing Heart Rate in the Use of Clove Oil as an Anesthetic for Jatimbulan Tilapia (Oreochromis niloticus). *Jurnal Penelitian Pendidikan IPA*, *9*(9), 7140–7145. https://doi.org/10.29303/JPPIPA.V9I9.5178

Virani, S. S., Alonso, A., Aparicio, H. J., Benjamin, E. J., Bittencourt, M. S., Callaway, C. W., Carson, A. P., Chamberlain, A. M., Cheng, S., Delling, F. N., Elkind, M. S. V., Evenson, K. R., Ferguson, J. F., Gupta, D. K., Khan, S. S., Kissela, B. M., Knutson, K. L., Lee, C. D., Lewis, T. T., … Subcommittee, O. behalf of the A. H. A. C. on E. and P. S. C. and S. S. (2021). Heart Disease and Stroke Statistics—2021 Update. *Circulation*, E254–E743. https://doi.org/10.1161/CIR.0000000000000950

Wickman, B. E., Enkhmaa, B., Ridberg, R., Romero, E., Cadeiras, M., Meyers, F., & Steinberg, F. (2021). Dietary Management of Heart Failure: DASH Diet and Precision Nutrition Perspectives. *Nutrients*, *13*(12). https://doi.org/10.3390/NU13124424

Widiastuti, I. A. E., Priyambodo, S., & Cholidah, R. (2023). Differences In Lipid Profiles Based on Physical Activity Levels Among First-Year Students In a Medical Education Research Program. *Jurnal Penelitian Pendidikan IPA*, *9*(2), 981–985. https://doi.org/10.29303/JPPIPA.V9I2.3627

Wong, Z. S. Y., Siy, B., Da Silva Lopes, K., & Georgiou, A. (2020). Improving Patients' Medication Adherence and Outcomes in Nonhospital Settings Through eHealth: Systematic Review of Randomized Controlled Trials. *Journal of Medical Internet Research*, *22*(8). https://doi.org/10.2196/17015

Yaghoubi, M., Javadi, M., Bahadori, M., & Ravangard, R. (2016). Health Promoting Hospitals Model in Iran. *Iranian Journal of Public Health*, *45*(3), 362. Retrieved from /labs/pmc/articles/PMC4851751/