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Telemonitoring-Based Cardiac Care to Reduce Readmissions in Coronary Heart Disease Patients

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Abstract

Coronary heart disease (CHD) continues to be a leading cause of hospital readmissions, especially among elderly individuals with low educational attainment and limited understanding of health information. This research aimed to evaluate how cardiac care management influences the frequency of hospital readmission in patients diagnosed with CHD. Employing a quasi-experimental method with a one-group pretest-post-test design, the study involved 100 participants at Jombang Hospital, chosen through purposive sampling. Information regarding readmission rates was gathered before and after the intervention using structured questionnaires and assessed through the Wilcoxon signed-rank test. Before receiving the intervention, 25% of patients had been re-admitted more than twice, while none avoided readmission altogether. Following the management program, only 5% experienced multiple readmissions, and 25% reported none. The statistical outcome demonstrated a significant difference ($p = 0.002$), proving that cardiac care interventions consisting of educational support, family involvement, and consistent follow-up effectively decreased patient readmission. Most participants were aged between 61 and 75, male, and had only completed elementary school, all of which are factors associated with poor disease self-management. This trial confirms that integrated cardiac care management greatly improves the outcomes of recovery and decreases the risk of rehospitalization in CHD patients.

Introduction

Cardiovascular disease remains the principal reason for early death and coronary artery complications at the global level, placing excessive burdens on the global healthcare system. Evidence clarifies that almost 48% of global fatalities result from this disorder (Roth *et al*., 2020). Patients with cardiovascular diseases have a high chance of being re-admitted to the hospital within 30 days of hospital discharge (Puyana *et al*., 2022). Patients with multiple comorbid states, such as poor movement, cognitive disorders, and mental disorders, are at severe risk for rehospitalization. These intricacies make the long-term observation and systematic pattern of delivering care invaluable (Murphy *et al*., 2025).

According to the World Health

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Organization (WHO), cardiovascular and circulatory diseases kill more than 17 million people per annum. The coronary heart disease accounts for only 31% of mortality in the world, or approximately 8.7 million deaths in one year (Boodidha *et al*., 2022). The majority of these deaths occur in more than 75% of the low- and middle-income economies. This disparity reveals serious gaps in access to quality healthcare and chronic disease control strategies (Arcidiacono, 2024). By the year 2020, CHD was predicted to become the top cause of death worldwide, contributing to 36% of all deaths, double the mortality rate of cancer. In Indonesia specifically, CHD was found to be the cause of 26.4% of all deaths, which is four times higher than the 6% death rate attributed to cancer (Tutiany *et al*., 2022).

Coronary heart disease is a progressive chronic disease with high mortality and frequent relapse, and most patients suffer from an inability to manage the disease independently. Despite the advances in pharmaceutical management, the recurrence is high, with 29% to 59% of the patients showing recurrence in the first six months following hospital discharge (Sigamani & Gupta, 2022). With multimodal management methodologies, patients with CHD continue to endure poor quality of life, high management expenditure, and outcomes similar to those for other chronic ailments. This would imply that medical adherence in isolation is insufficient, and effective post-hospital support becomes invaluable (Lin & Juang, 2024). Hence, the patient continues to be unable to self-manage the healthcare needs during the transition phase following the duration of discharge (Dalfó Pibernat *et al*., 2021).

Various factors, such as increased physical workload, are responsible for the recurrence of coronary heart disease. The recurrence following the initial cardiac event foretells the participation of multiple predisposing conditions (Wang *et al*., 2019). Comorbid conditions such as diabetes, smoking, dyslipidemia, hypertension, and socioeconomic disadvantages, as well as secondary precipitants such as acute stress or infection, lead to the long-term outcomes (Velek *et al*., 2022). Management of these variables prevents complications and recurrence (Imamura *et al*., 2025). Heart disease is one of the chronic illnesses requiring ongoing interaction between patients and healthcare providers. CHD patients require ongoing support to have the best health and functional capacity (Siu *et al*., 2020). Effective care and prevention require a combination of health promotion, early prevention, medical treatment, and rehabilitation. However, despite following standard treatment protocols, many patients are still readmitted due to insufficient follow-up care after discharge (Perez Garcia *et al*., 2024). Hospital readmission occurs in nearly 45% of patients in the initial one year and is independently associated with unhealthy lifestyles. Low adherence increases the rate of morbidity, mortality, and the risk for readmission (Abraham *et al*., 2020).

The secondary preventive measures include the following specific interventions in proven coronary heart disease patients to reduce the risk for recurrent cardiac events. These include the encouragement for individuals to take on healthier lifestyles, such as quitting smoking, attaining the best lipid profile achieved, regular exercise, and efficient stress management, since these interventions play an integral role in preventing future cardiovascular events (Sigamani & Gupta, 2022). In the elderly being discharged after cardiac hospitalization, in particular those high-risk patients, regular participation in moderate physical activities such as walking or even running has been found to aid vascular health and enhance general outcomes in terms of recovery (Winnige *et al*., 2021). Regardless of these interventions, recurrent hospital admissions continue to persist. This is often attributed to lapses in medication adherence, overexertion, failure to recognize early signs of heart failure, or noncompliance with dietary guidelines (Folbert *et al*., 2025). Against this background, the present study seeks to evaluate the potential of telemonitoring-based cardiac care in mitigating the rate of hospital readmissions among patients living with coronary heart disease.

Method

This study employed a quasi-experimental design, utilizing a one-group pretest-posttest approach. The research population included all

patients diagnosed with coronary heart disease who received treatment at Jombang Hospital. A total of 100 respondents were selected. Before the intervention, measurements related to the readmission variable were taken. Afterwards, the respondents were administered cardiac care management interventions, and at the end of the intervention, the posttest measurement for the readmission variable was carried out.

The participants were sampled by using the technique of purpose sampling, where the sample would meet the criteria set by the researcher. Cardiac care management was the independent variable, and the hospital readmission rate for patients with coronary heart disease was the dependent variable. Data gathering was accomplished by the researcher directly, by measuring the dependent and the independent variables with the aid of a structured questionnaire. During data collection, respondents were accompanied by family members when needed. The data obtained were then processed and analyzed using the Wilcoxon signed-rank test to determine the difference in readmission rates before and after the cardiac care management intervention.

Result and Discussion

The table here shows the demographic characteristics of the 100 study participants. The majority of participants were aged 61–75 years (55%), reflecting that the population mainly consisted of elderly individuals, the classic group of patients suffering from coronary heart disease. The majority were males at 55%, reflecting a relatively higher incidence in males in this population. The population was mostly unschooled in terms of education; 85% of the respondents had only a primary school education, and this may reflect weak health literacy and highlight the value of simplified education in cardiac patient management programs.

This table presents the comparison of patient readmission frequency before and after receiving cardiac care management. Before the intervention, 25% of patients experienced

Table 1. Respondents' Demographic Characteristics (n = 100)

No.	Variable	Category	Frequency	Percentage (%)
1.	Age	< 61 Years	30	30%
		61-75 Years	55	55%
		> 75 Years	15	15%
2.	Gender	Male	55	55%
		Female	45	45%
3.	Education Level	Primary School	85	85%
		Junior High School	5	5%
		Senior High School	5	5%
		Diploma/Bachelor's Degree	5	5%

Table 2. Comparison of Respondents' Hospital Readmission Before and After Cardiac Care Management (n = 100)

No.	Readmission Frequency	Pre-Intervention	Post-Intervention
1.	< 1 Time	0 (0%)	25 (25%)
2.	1 Time	40 (40%)	50 (50%)
3.	2 Times	35 (35%)	20 (20%)
4.	> 2 Times	25 (25%)	5 (5%)
Amount		100 (100%)	100 (100%)
Wilcoxon Test		p = 0.002	

more than two readmissions, and none had fewer than one. After the intervention, those with >2 readmissions dropped to 5%, and 25% reported no readmission at all. The Wilcoxon Signed-Rank Test produced a p-value of 0.002, demonstrating a statistically significant decline in hospital readmissions following the intervention ($p < 0.05$). Coronary heart disease remains the leading cause of hospitalization in individuals 65 years and over, with high clinical complexities and financial costs to healthcare systems. In the research, the age group 61-75 years represented the majority of the participants (55%), validating that the elderly remain at high risk for cardiovascular diseases. This evidence in itself is accompanied by the physiologic changes with aging, the thickening of the ventricular wall of the ventricle, the fibrosis and calcification of the valves of the heart, specifically the annulus of the mitral valve, and the valves of the aorta, and decreasing sinoatrial cells of the node, all of which affect the conduction and functions of the heart negatively (Shivkumar *et al*., 2023). These structural and functional changes lower the compensation capability of the heart, putting the elderly at risk for decompensation and multiple admissions to the hospital. Shen *et al*. (2025) emphasized that age-related loss was primarily responsible for unfavorable self-care and increased risk for cardiac readmission.

The analyses also established that the patients were primarily males (55%), in line with global figures showing the high incidence of coronary heart disease in males. The inequality in the volume of hormones, lifestyles, and exposure to cardiovascular risk in the life history might be the reason for this. Nonetheless, it's significant to accept the fact that elderly women may have poor outcomes due to late diagnosis and limited access to services, although the incidence is the same or lower (Nguyen *et al*., 2024). Galván-Román *et al*. (2022) established the fact that men and women respond differently to medication for the heart and have different health behaviors, and this has the capacity to heavily impact the manner in which the conditions of the heart evolve and the manner in which the patients recover, particularly the elderly. Because of this, it's vital to take gender and age into consideration during the development of effective post-hospitalization plans for the patients.

Level of education is also one of the important predictors of the patients' ability to cope with chronic conditions such as coronary heart disease. For this research, most of the respondents had only an elementary education (85%), showing the low general health literacy of the sample. This is the reason for the lack of recognition of the early cardiac symptom and the poor compliance with the treatment regimen, both of which heighten the risk of readmission (Lahoz *et al*., 2020). Armalina *et al*. (2020) found that efficient screening and preventive education, early electrocardiography, and hypertension screening were essential in the management of cardiovascular risk, particularly in the low-education population. This underscores the value of incorporating simple, focused educational interventions in the approaches to cardiac care.

This research established a definite pre- and post-intervention difference in hospital readmissions following the application of cardiac care management. Pre-intervention, 25% of the respondents had been readmitted more than twice, and none had been readmitted less than once. After being administered cardiac care management, only 5% were readmitted more than twice, and 25% had no readmission at all. The result shows a significant clinical deterioration and acute relapse event reduction following structured intervention. The application of the Wilcoxon Signed-Rank Test to the data resulted in the establishment of the p-value at 0.002, hence indicating the presence of a statistically significant disparity in the pre- and post-intervention readmission rates.

In this study, cardiac care involved regular check-ins, personalized education for patients, and engaging their families in the process. Mace & Lidströmer (2024) found that well-structured cardiac care programs help lower hospital readmission rates by encouraging patients to stick to their treatments and recognize symptoms early. Having family involved also plays a key role in achieving these positive outcomes. Ali *et al*. (2020) found that diet awareness, daily family habits, and social expectations have a strong impact on heart

health. Getting the family involved doesn't just encourage healthier behaviors, but it also helps spot early warning signs and keeps care on track.

Some factors may influence the effectiveness of cardiac care management, more specifically those for discharge planning, communication, and follow-up care. The absence of individualized discharge planning, misprescription of medications, and ineffectual provider–patient communication were found by Lee *et al*. (2022) to overwhelmingly contribute to readmissions. Education administered to patients and families in this study most likely favorably influenced home care after discharge. Ali *et al*. (2020) concluded that the cardiovascular health status has significant associations with nutrition awareness and lifestyles, and hence concluded that family-centered interventions and general health education may impact the return to normal and long-term outcomes. McKenna *et al*. (2023) pointed to the patient empowerment by means of health literacy and patient participation in planning for their care in reducing hospital admissions and late complications.

However, the absence of proper cardiac care management has undesirable outcomes, including confusion over medication changes and inadequate home-based management. Becker *et al*. (2021) clarified that patients discharged from the hospital with inadequate instructions end up feeling overwhelmed and incapable of handling cumbersome regimens, hence preventable readmissions. The situation is even more critical for elderly patients with poor educational backgrounds, like those in this research. Consequently, effective cardiac care planning needs to emphasize clinical outcomes aside from incorporating social support, education of caregivers, and follow-up mechanisms. In sum, the finding of this study underscores the value of patient-centered comprehensive cardiac management in minimizing hospital readmission risk.

Conclusion

The study found that coronary heart disease patients, especially those who were 61-75 years old, male, and poorly educated, had been readmitted to the hospital at a fairly high rate. The reasons for multiple hospital admissions included restricted health literacy, poor knowledge about home care, and lack of support from the family. The adoption of structured management for cardiac care, namely patient education, involvement of the family, and systematic follow-up, resulted in the expected decline in the number of readmissions. Statistical testing verified the presence of a significant difference in readmission prior to and after the intervention, providing evidence to support the effectiveness of holistic, patient-focused management for cardiac care in enhancing clinical outcomes and minimizing the incidence of readmissions to the hospital for patients with coronary heart disease.

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