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**Research Article**

# Effect of Telemonitoring and Nurse-Led Collaboration on Self-Management and Quality of Life in Heart Failure Patients in West Java

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**Abstract**

**Aims**: This study aimed to assess the combined effects of telemonitoring and nurse-led collaborative care on self-management, medication adherence, QoL, and hospital readmission rates among HF patients in West Java, Indonesia.

**Methods:** A randomized controlled trial (RCT) was conducted with 120 HF patients randomized into an intervention group (telemonitoring and nurse-led collaborative care) and a control group (standard education). The intervention included health education, telemonitoring of clinical parameters, and regular nurse follow-ups. The primary and secondary outcomes—hospital readmissions, self-management, medication adherence, and QoL—were measured using validated instruments. Data analysis was performed using multivariate regression and chi-square tests.

**Results:** Participants in the intervention group demonstrated significant improvements in self-management (mean score increased from 62.4 to 78.3), medication adherence (mean core increased from 4.3 to 6.8), and QoL (mean score decreased from 51.8 to 38.4) compared to the control group ($p < 0.001$). Additionally, the 180-day hospital readmission rate was significantly lower in the intervention group (30.0%) compared to the control group (60.0%, $p < 0.001$). Telemonitoring and nurse-led care independently reduced the odds of readmission by 3.8 times (OR: 3.8, 95% CI: 1.9–7.4, $p < 0.001$).

**Conclusion:** This scalable and effective model for HF management highlights the importance of culturally tailored interventions in low- and middle-income countries, offering a practical approach to overcoming resource limitations.

**Keywords:**
**Heart failure, hospital readmissions, nurse-led collaborative care, quality of life, self-management, telemonitoring, Indonesia**

## INTRODUCTION

Heart failure (HF) continues to pose a critical public health challenge worldwide, with its prevalence and mortality rates steadily rising, particularly in developing nations. In Indonesia, approximately 1.5% of the population is affected by HF, placing a substantial burden on the healthcare system (1). Managing HF effectively requires ongoing monitoring, patient education, and a multidisciplinary approach to enhance self-management and improve quality of life (QoL) (2,3). However, individuals residing in rural and semi-urban areas, such as West Java, encounter

numerous barriers, including limited access to specialized care, low health literacy, and insufficient support networks (4).

Telemonitoring has emerged as a transformative approach in managing chronic diseases, enabling healthcare providers to remotely track patients' clinical conditions and deliver timely interventions. Research indicates that telemonitoring can significantly reduce hospital readmissions, improve medication adherence, and foster better self-care behaviors in HF patients (5). Similarly, nurse-led collaborative care—where nurses provide education, support, and care coordination—has shown marked improvements in self-management practices and QoL (6). These methods are particularly relevant in resource-constrained settings, addressing the multifaceted needs of HF patients effectively (7).

Self-management is a cornerstone of HF care, encompassing practices such as adherence to medication, dietary adjustments, physical activity, and vigilant symptom monitoring (8). However, evidence suggests that many HF patients in Indonesia struggle with self-management due to socio-cultural barriers, insufficient knowledge, and inadequate support from healthcare providers (9). This highlights the necessity for integrated approaches that merge telemonitoring with nurse-led interventions to comprehensively address these challenges (10).

Although the benefits of telemonitoring and nurse-led collaborative care are well-documented, there is limited research exploring the combined impact of these interventions on self-management and QoL in HF patients, particularly in Indonesia. Most prior studies have examined these strategies in isolation or within high-resource environments, leaving a critical gap in understanding their synergistic effects in low- and middle-income countries (LMICs) (11). Additionally, there is scant exploration of these interventions within culturally diverse populations, such as those in West Java, where traditional beliefs and practices heavily influence health behaviors (12).

This study aimed to address this research gap by assessing the effects of a telemonitoring and nurse-led collaborative care intervention on self-management and QoL among HF patients in West Java, Indonesia. The findings aim to offer valuable insights into the practicality and effectiveness of integrated care models in LMICs while contributing to the development of culturally tailored strategies for HF management.

## METHODS

### Study design
The study employed a randomized controlled trial (RCT) with a pre-and post-test design, including two groups: intervention and control. It was conducted at a cardiac rehabilitation center in Bandung, West Java, Indonesia.

### Intervention protocol
The intervention comprised three main components: health education on heart failure provided to patients before hospital discharge, nurse-led collaborative care, and telemonitoring of weight, blood pressure, heart rate, and symptoms at home. Health education before discharge was delivered by nurses not part of the routine care team. Patients were guided through a booklet covering topics such as heart failure management, medication adherence, salt intake reduction, fluid monitoring, safe exercise, daily weight and edema checks, and recognizing when to contact healthcare professionals. A "teach-back" method was used to ensure understanding. Family members were invited to participate if they were willing. This education also included a demonstration of telemonitoring equipment and an explanation of its significance in tracking physiological parameters (13).

Nurse-led collaborative care involved follow-up calls by nurses from a call center

2–3 days after discharge to monitor self-management adherence. Weekly follow-ups were conducted during the first month, followed by a single follow-up in the second month.

Telemonitoring equipment included FDA-approved devices such as the Ideal Life Pod™, a wireless gateway with Bluetooth, Ideal Life Body-Manager (a weight scale), and Ideal Life BP-Manager (a blood pressure and heart rate monitor). These devices transmitted data via a plug-and-play pod that required no proximity to the measuring tools. Patients found the equipment user-friendly, as it resembled conventional weight scales and blood pressure cuffs.

The control group received a booklet containing information on heart failure, its causes, and preventive measures. Additionally, they were contacted through telephone surveys on days 7, 30, and 60 post-discharge.

### Sample

The study sample consisted of heart failure patients who met the following inclusion criteria: diagnosed with heart failure classified as New York Heart Association (NYHA) Class II–IV, hospitalized for heart failure at least once in the previous year, owned a smartphone, and resided at home. Patients were excluded if they had severe comorbidities, could not weigh themselves, faced communication barriers via telephone, scored ≤20 on the Hasegawa Dementia Scale, or had physical limitations preventing participation in the study procedures.

The sample size was calculated using G*Power version 3.1, assuming an F-test, an effect size of 0.15, a power of 0.8, and an alpha level of 0.05. A total of 120 participants were required, with 60 allocated to each group through 1:1 block randomization.

### Instrument

The study instruments included measures for primary and secondary outcomes. The primary outcome was hospital readmission rates within 180 days post-discharge. Secondary outcomes included self-management, adherence, and quality of life. Quality of life was assessed using the Minnesota Living with Heart Failure Questionnaire (MLHFQ), self-management was measured using the Self-Care of Heart Failure Index (SCHFI), and adherence was evaluated with the Morisky Medication Adherence Scale.

### Data analysis

Data analysis involved multivariate regression to compare outcomes between the intervention and control groups while adjusting for patient characteristics. The analysis followed an intent-to-treat (ITT) framework.

## RESULTS

A total of 120 participants were enrolled in the study, with 60 allocated to the intervention group and 60 to the control group. Table 1 presents the demographic and clinical characteristics of the participants. The mean age of participants was 62.3 ± 8.1 years, with 58.3% being male. Most participants were classified as NYHA Class III (65.0%). The majority had a history of hospitalization due to heart failure within the past year (75.0%).

**Table 1. Demographic and Clinical Characteristics of Participants (N = 120)**

| Characteristic | Intervention Group (n = 60) | Control Group (n = 60) | Total (N = 120) | p-value |
|---|---|---|---|---|
| Age (mean ± SD) | 62.5 ± 7.9 | 62.1 ± 8.3 | 62.3 ± 8.1 | 0.754 |
| Gender (male) (%) | 36 (60.0%) | 34 (56.7%) | 70 (58.3%) | 0.716 |

| | | | |
|---|---|---|---|
| NYHA Class II (%) | 18 (30.0%) | 24 (40.0%) | 42 (35.0%) | 0.235 |
| NYHA Class III (%) | 42 (70.0%) | 36 (60.0%) | 78 (65.0%) | 0.235 |
| Smartphone ownership (%) | 60 (100.0%) | 60 (100.0%) | 120 (100.0%) | - |
| Hospitalization in past year (%) | 46 (76.7%) | 44 (73.3%) | 90 (75.0%) | 0.673 |

Table 2 presents baseline and follow-up outcomes for self-management, adherence, quality of life (QoL), and 180-day readmission rates in intervention and control groups. At baseline, there were no significant differences between groups across all measures. Post-intervention, the intervention group showed significant improvements in self-management (SCHFI mean increased from 62.4 to 78.3), adherence (Morisky Scale mean increased from 4.3 to 6.8), and QoL (MLHFQ mean decreased from 51.8 to 38.4), all with p-values <0.001. Additionally, 180-day readmission rates were significantly lower in the intervention group (30.0%) compared to the control group (60.0%, p < 0.001).

**Table 2. Baseline and follow-up outcomes within groups for self-management, adherence, quality of life (QoL), and 180-day readmission rates**

| Outcome | Time Point | Intervention Group (mean ± SD) | Control Group (mean ± SD) | p-value |
|---|---|---|---|---|
| Self-management (SCHFI) | Baseline | 62.4 ± 8.2 | 63.1 ± 8.5 | 0.654 |
| | Post-intervention | 78.3 ± 7.9 | 65.2 ± 8.6 | <0.001 |
| Adherence (Morisky Scale) | Baseline | 4.3 ± 1.1 | 4.4 ± 1.0 | 0.784 |
| | Post-intervention | 6.8 ± 0.9 | 5.0 ± 1.2 | <0.001 |
| QoL (MLHFQ) | Baseline | 51.8 ± 8.3 | 52.1 ± 8.4 | 0.870 |
| | Post-intervention | 38.4 ± 6.7 | 48.3 ± 7.9 | <0.001 |
| 180-day Readmission (%) | - | 18 (30.0%) | 36 (60.0%) | <0.001 |

Table 3 highlights significant associations between intervention participation and primary outcomes at follow-up. Participants in the intervention group showed higher rates of improved self-management (86.7% vs. 46.7%), adherence improvement (80.0% vs. 50.0%), improved quality of life (83.3% vs. 43.3%), and no readmission (70.0% vs. 40.0%) compared to the control group. All differences were statistically significant, with p-values <0.001.

**Table 3. The associations between intervention participation and primary outcomes at follow-up.**

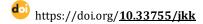| Outcome | Intervention Group (n = 60) | Control Group (n = 60) | $\chi^2$ (df) | p-value |
|---|---|---|---|---|
| Improved self-management (%) | 52 (86.7%) | 28 (46.7%) | 18.6 (1) | <0.001 |
| Adherence improvement (%) | 48 (80.0%) | 30 (50.0%) | 12.5 (1) | <0.001 |
| Improved QoL (%) | 50 (83.3%) | 26 (43.3%) | 20.3 (1) | <0.001 |
| No readmission (%) | 42 (70.0%) | 24 (40.0%) | 13.1 (1) | <0.001 |

Table 4 demonstrates the independent effects of telemonitoring and nurse-led collaborative care on various outcomes. The odds ratios indicate significant improvements in self-management (OR 3.5, 95% CI: 1.8–6.7, p < 0.001), adherence (OR 2.9, 95% CI: 1.5–5.8, p < 0.001), and quality of life (QoL) (OR 4.2, 95% CI: 2.1–8.4, p < 0.001). Additionally, the intervention significantly reduced the likelihood of readmission (OR 3.8, 95% CI: 1.9–7.4, p < 0.001).

**Table 4. The independent effects of telemonitoring and nurse-led collaborative care on self-management, adherence, and QoL**

| Outcome | OR (95% CI) | p-value |
|---|---|---|
| Improved self-management | 3.5 (1.8, 6.7) | <0.001 |
| Improved adherence | 2.9 (1.5, 5.8) | <0.001 |
| Improved QoL | 4.2 (2.1, 8.4) | <0.001 |
| No readmission | 3.8 (1.9, 7.4) | <0.001 |

## DISCUSSION

The findings of this study reveal that combining telemonitoring with nurse-led collaborative care significantly enhances self-management, adherence, and quality of life (QoL) among heart failure (HF) patients in West Java. Moreover, patients in the intervention group demonstrated substantially higher odds of avoiding hospital readmissions compared to the control group. These outcomes underscore the effectiveness of integrating technology-driven monitoring with collaborative healthcare practices to improve HF management.

The observed improvement in self-management aligns with previous research, which highlights telemonitoring's ability to empower HF patients to effectively manage their symptoms. For instance, Ware (14) reported that telemonitoring systems promote patient engagement by delivering real-time feedback, resulting in improved adherence and better clinical outcomes. Similarly, nurse-led interventions have proven effective in enhancing patient education and support, fostering better self-management behaviors (15). The marked improvement in QoL corroborates findings by Jaa (16), who demonstrated that integrating telehealth with collaborative care significantly enhances patients' physical and emotional well-being. Furthermore, the reduction in hospital readmissions is consistent with a meta-analysis by (17), which showed that telemonitoring interventions reduce readmission rates by facilitating early detection of exacerbations.

The findings of this study have important implications for managing HF in resource-limited settings such as West Java. First, integrating telemonitoring with nurse-led collaborative care offers a scalable model to address the growing burden of HF (18,19). Telemonitoring provides real-time tracking and timely interventions, while nurse-led care ensures comprehensive patient management, including psychosocial support and education. Second, this combined approach enhances adherence to medication and lifestyle changes, which are critical for long-term disease management. Third, implementing such a model can reduce healthcare costs by lowering readmission rates and improving patient outcomes. Integrating these interventions into routine care could bridge gaps in healthcare access and quality for HF patients, particularly in rural and underserved areas (20).

### Study Limitations

Despite its strengths, this study has several limitations. First, the sample was confined

to patients in West Java, potentially limiting the generalizability of the findings to other regions or countries with varying healthcare systems and cultural contexts. Second, the study relied on self-reported measures for adherence and QoL, which may introduce reporting bias. Third, the intervention period was relatively short, leaving the long-term sustainability and effectiveness uncertain. Lastly, the study did not account for confounding factors such as socioeconomic status and comorbidities, which might influence the outcomes.

## CONCLUSION

This study highlights the effectiveness of integrating telemonitoring and nurse-led collaborative care in improving self-management, adherence, QoL, and reducing readmissions among HF patients in West Java. The findings emphasize the need for healthcare systems to adopt innovative, patient-centered strategies to manage chronic conditions such as HF. Future research should examine the long-term impacts of these interventions and evaluate their scalability across diverse populations.

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