Original Article
DOI: https://doi.org/10.70749/ijbr.v3i5.1243

INDUS JOURNAL OF BIOSCIENCE RESEARCH
https://induspublishers.com/IJBR
ISSN: 2960-2793/ 2960-2807

Telemedicine in the Management of Chronic Heart Failure: Patient Outcomes and Satisfaction

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ARTICLE INFO

Keywords: Telemedicine, Chronic Heart Failure, Patient Satisfaction, Remote Monitoring, Healthcare Outcomes.

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Declaration
Authors' Contribution: All authors equally contributed to the study and approved the final manuscript.
Conflict of Interest: No conflict of interest.
Funding: No funding received by the authors.

Article History
Received: 24-01-2025 Revised: 13-04-2025
Accepted: 26-04-2025 Published: 05-05-2025

ABSTRACT

Introduction: Chronic heart failure (CHF) is one of the major global healthcare burdens manifested by recurrent hospitalizations. Telemedicine has now become considered a viable solution for the effective management of CHF since constant monitoring can be done, and timely intervention can also be taken. **Objective:** To assess the effectiveness of telemedicine and perceive the level of patient satisfaction in the case of chronic heart failure. **Materials and Method:** This study aims to identify various demographics and clinical characteristics of the study patients at Hayatabad Medical Complex Peshawar, Pakistan from April, 2024 to September 2024. One hundred and ten patients with NYHA Class II to IV heart failure were in the study using a structured telemedicine setup. Concerning the outcomes of the study, both the clinical and the patient satisfaction scores were evaluated. **Results:** Hospital readmissions reduced statistically from 36.4% to 16.4%, and emergency visits went down from 25.5 % to 9.1%. The NYHA class improved in more than 60% of the patients. Patient self-perceived satisfaction was high, and 87% of patients were highly satisfied using telemedicine, citing convenience and timely health care. **Conclusion:** Telemedicine is an effective tool that aids overall improvement in clinical outcomes and patients' satisfaction in cases of CHF. It gives hope for an effective model of chronic disease management in low-resource countries.

INTRODUCTION

Telemedicine can be described as an improvement model in the management of chronic diseases such as CHF, and its use has provided solutions in care delivery, hospitalization, and results. Regarding the increasing burden of CHF all over the world, more efficient, effective, and easy-to-implement methods for managing the condition that would improve the quality of life of the patients are warranted. The effectiveness of traditional care models is lacking in meeting the needs of continuously and closely monitoring and intervening when necessary for patients living in rural or other undeveloped areas. In this regard, telemedicine has the potential to provide remote monitoring, prompt consultation, and timely intervention (1). Chronic heart failure is a long-term disease that requires follow-up medical care and proper changes in the patient's behavior. Telemedicine has proven beneficial when it comes to heart failure care since it has improved the identification of the status of decompensation, tailoring of treatment, and increased patient involvement (2).

However, patients seem to embrace telemedicine because of the convenience brought about by the current technology and specifically by the COVID-19 outbreak (3). Telemedicine was valuable as it provided quality health care without close physical contact, especially towards the end of this period, and the adoption of telemedicine services has been informed by the positive outcomes and patients' satisfaction. A Cochrane review and meta-analysis confirmed that telemedicine was effective in cardiovascular disease treatment since patients experienced increased survival and reduced hospitalization rates as an enhanced quality of life in patients with heart failure (4). Furthermore, it has been found that patients' compliance with telehealth programs has always influenced enhanced clinical results. The Adherence substudy of the TIM-HF2 trial showed that RACE not only increased the level of adherence but also

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increased overall patient satisfaction, referring to telemedicine as a pragmatic tool in practical clinical practice (5). These findings illustrate that the effectiveness of telemedicine is not only in managing the symptoms but also in enabling the patient to have more control of his or her condition.

Telehealth can also be seen to have advantages in the post-discharge care situation as well. Another cross-sectional study done in Thailand showed that brief telemonitoring for heart failure patients effectively enhanced functional status, lowered hospitalization rates, and boosted satisfaction with being docket (6). These outcomes show that telemedicine actually fits the need to fill care gaps in the vulnerable periods after discharge from the hospital. This is even more pronounced in LMICs where, despite receiving care, the healthcare facilities may not afford steady quality care to cardiac patients. In support of the use of telemedicine on patients with heart failure with reduced ejection fraction in Vietnam, a study was conducted, and it revealed that patients who received care through telemedicine had a better quality of life, implying that the approach is sustainable and can be implemented anywhere around the world (7).

The survey highlighted patients' satisfaction as one of the critical values of the healthcare system, and telemedicine does not disappoint in this aspect. Reviews of acute care patients also showed satisfaction with telehealth services and attributed it to timely and appropriate technology and proper communication between the provider and the patient. Besides patient satisfaction, there are other improvements that have been witnessed in clinical practices due to telemedicine. A recent meta-analysis revealed that telemedicine helps to increase the patient's compliance with prescribed treatments and also decreases their mortality in chronic heart failure, thus confirming the long-term effectiveness of interventions delivered through telemedicine (9). However, the evaluation of patient satisfaction with telemedicine is still a challenge. A recent review pointed out a problem in the methods used and applied in the studies and recommended the need to develop a standard model of measures (10). The above-determined tools would help clinicians and researchers improve the comprehension of the patient's experiences and adapt the telemedicine interventions.

Other innovative technologies have also been implemented, including avatar-assisted teleconsultations, which serve as a patient-friendly dynamic method of undertaking consultation, delivery of information, and patient support. These novel applications may also improve patient compliance and patient satisfaction, particularly in populations with higher exposure to technology (11). Telemedicine can be effective in managing elderly cardiac patients who experience mobility and transportation issues to clinics for follow-up appointments, thus preventing clinical relapse (12). Nurse telecommunication ventures incorporated in patients' homes have also today proved to enhance the results of chronic diseases such as heart failure. These models highlight the need for collaboration between various care disciplines and note the strong leadership that nurses play in telehealth approaches to providing individualized patient-centered care (13). In addition, the application of telemedicine in home care management for CHF patients with other diseases like type II diabetes has proved to be effective since it helps to better manage the diseases and reduce their overall cost (14).

The shift towards telehealth can be seen as a revolution as it is changing the way of thinking towards the possibility of improving heart failure care by engaging patients and clinicians more continuously and in a more flexible manner. Current advancements in Informatics present digital health solutions as a chance to revolutionize the processes of dealing with heart failure, especially in areas with low-access medical care (15). The accumulation strengthens the significance of telemedicine in improving clinical effectiveness, patient satisfaction and providing effective organization of care in chronic heart failure.

Objective

To assess the consequences of telemedicine to the admission of chronic heart failure patients and the patient's satisfaction regarding the utility, accessibility, and contribution to the enhancements of the healthcare systems.

MATERIALS AND METHODS

Design: Prospective observational study.

Study Setting: This study was done at Hayatabad Medical Complex Peshawar, Pakistan.

Duration: The study was carried out over a six-month period, from April, 2024 to September 2024.

Inclusion Criteria

This study was conducted on patients with CHF NYHA class II-IV, 18 years and above, with access to a smartphone or the internet, and who were willing to engage in telemedicine follow-up. The participants had to give their informed consent and, at the same time, show the ability to use the telehealth application.

Exclusion Criteria

Patients who have severe cognitive impairment, psychiatric disorders, patients with hearing/visual impairments, or those who were unable to communicate or did not own necessary equipment were excluded from this study.

Methods

The participants were recruited during their clinic cardiology outpatient visits and other instances of

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hospitalization due to HF. Participants were enrolled and provided with an orientation on the relevant hospital telemedicine system involving video conferences, pill advice, and remote check of symptoms. Telephone follow-up two weeks later was completed, as well as once a week, and inter velocity was checked daily through a secure mobile application to record weights, pulse rate, blood pressure, and any new symptoms. The patient's status could be monitored daily and encouraged to be active by cardiologists, nurses, and telehealth coordinators involved in the patient's care. Data related to patient satisfaction were collected during the last week of the study period using the internationally validated questionnaire, and clinical data such as hospitalization, emergency visits, and symptom severity were also collected. Statistical analysis was done using the Statistical Package for the Social Sciences (SPSS) version 25. Descriptive statistics were used on demographic characteristics, while t-test paired and chi-square were used to compare the pre and post-intervention data and the change in outcome and satisfaction scores. The research protocol was approved by the hospital's institutional review board.

RESULTS

The patients included in the study were 120, and the number of patients who completed the six-month follow-up through telemedicine was 110. The participants had a mean age of 61.4 ± 10.2 years, and gender distribution ranged from sixty-four (58.2%) males and forty-six (41.8%) of them were females. About 58% of patients were included in the NYHA Class II and 35% in the NYHA Class III at the beginning of the study. This consisted of 70% of the patients having hypertension or diabetes and the like. It can be noted that the patients who promised to return for telemedicine follow-up visits complied with the offer 93% of the time, and technical difficulties were rare.

Table 1 shows baseline demographic and clinical characteristics of the study population.

Table 1

Baseline Characteristics of Participants (n = 110)

Characteristic	Value
Mean Age (years)	61.4 ± 10.2
Gender (Male/Female)	64 (58.2%) / 46 (41.8%)
NYHA Class II	64 (58%)
NYHA Class III	39 (35%)
NYHA Class IV	7 (6.4%)
Hypertension	82 (74.5%)
Diabetes Mellitus	56 (50.9%)

These measures were also valued within the follow-up period and revealed the decreased frequency of readmission to the hospital and emergency room attendance. Emergency readmissions reduced from 40 or 36.4% in the six months before the intervention to the study period's 18 or 16.4% ($p < 0.01$). The number of emergency visits that were made was also reduced from 28 (25.5%) to 10 (9.1%) ($p < 0.05$). Patients also pointed out the amelioration of the symptoms, 68 (61.8%) of them had reduced their NYHA class by the end of the study period.

Table 2

Clinical Outcomes Before and After Telemedicine Intervention

Outcome	Pre-Intervention	Post-Intervention	p-value
Hospital Readmissions	40 (36.4%)	18 (16.4%)	<0.01
Emergency Room Visits	28 (25.5%)	10 (9.1%)	<0.05
NYHA Class Improvement	–	68 (61.8%)	<0.01

Patient satisfaction was generally high. The overall telemedicine experience was also evaluated on a Likert scale, with the overall average of respondents, five being the highest 83% of the respondents gave telemedicine a satisfactory rating of 4 or higher. Some of the reasons that kept the development of satisfaction at a low level include convenience, reduced burden in terms of travel, and timely access to physicians. However, 8 (7.3%) patients expressed dissatisfaction with the service, mainly because of connectivity problems or the mobile application.

Table 3

Patient Satisfaction with Telemedicine Services

Satisfaction Domain	Very Satisfied	Satisfied	Neutral	Dissatisfied
Overall Experience	58 (52.7%)	38 (34.5%)	6 (5.5%)	8 (7.3%)
Ease of Communication	66 (60.0%)	32 (29.1%)	8 (7.3%)	4 (3.6%)
Convenience	72 (65.5%)	30 (27.3%)	5 (4.5%)	3 (2.7%)

These findings support the effectiveness of telemedicine in reducing hospital utilization and improving patient satisfaction among individuals with chronic heart failure.

DISCUSSION

This paper has shown that telemedicine is a very useful tool for chronic heart failure patients as it leads to better clinical outcomes and patient satisfaction. The study's findings agree with established literature regarding the role of telemedicine in chronic illness care delivery. The above findings of fewer readmissions and decreased emergency visits are in line with the findings made by Alvarez et al., who state that monitoring facilitates the identification of clinical worsening and allows for prompt management to reduce adverse events and hospital admissions (1). In this study, the telemedicine model was effective not only in attaining better clinical stability but also in increasing the patients' activity and compliance with some scheduled treatment regimens. A patient satisfaction perspective was the overall focus of this study, with 86% noting satisfaction with telehealth

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services. This agrees with the study conducted by Cho and colleagues, who noted that patients experienced enhanced control in telehealth visits because of increased access and reduced spatial constraints (2).

Likewise, Raman and Vyselaar identified that patients' perceptions were positive when care was delivered through telecommunication platforms, especially for patients who have built good relationships with their healthcare providers (3). Finally, in terms of follow-up, the patients always found themselves dealing with the same care team, which might have led to positive responses in terms of satisfaction. Kuan et al. have done a Systematic Review and Meta-Analysis, which established that telemedicine has beneficial effects on cardiovascular diseases concerning quality of life and mortality in CHF patients. This is supported by the study results, where only 61.8% of the patients moved from a higher NYHA class to a lower class over the six-month period. This can be attributed to optimizing dosages of medicines, early sign identification, and repeated emphasis on lifestyle changes through teleconsultations. These correlate with findings by Prescher et al. in the TIM-HF2 trial posthoc analysis, which showed that patients under remote patient management had enhanced self-care and improved symptom management.

Furthermore, it is evident that similar success in the outside world is also feasible due to the impact of the intervention. Somsiri et al. stated that Thai heart failure patients who attended the transitional telehealth program had a lower rate of rehospitalization and higher functional status compared to those who did not attend (6). Likewise, a study done in Vietnam by Tran et al. showed significant improvement in the quality of life of heart failure patients managed by telemedicine, which supports the case for telehealth globally (7). Less traveling and offering an extended clue to follow-up examinations also highly contribute to both patient satisfaction and compliance since, in most developing countries, specialty care is scarce.

Concerning the measures of technology, it was shown that high technological accessibility and user-friendly interfaces were compliant with patients. There are a few complaints that can be considered minor and are related to connectivity issues or confusing mobile interfaces. Similar obstacles have also been observed in other telemedicine studies. According to Eldaly et al., usability and online accessibility should always be considered since they are the keys to effective patient engagement in telehealth (8). In addition, Wang et al., in their meta-analysis, supported that telemedicine implementation relies not only on clinical pathways but rather on the technical context as well as the receptiveness of patients to digital medicine (9). Nevertheless, the sense of patient satisfaction with telemedicine remains questionable if the methods for its measurement are not found. Mohd Noor et al. discussed that some related tools have been employed inappropriately and are not fully homogeneous. Therefore, it is necessary to form a set of indices to make the comparisons for constants (9). In the present research, a quantitative survey was developed based on a modified Likert scale that gives an overall impression of patients' attitudes toward telehealth but does not provide information on their subjective and prefrontal reactions. Future studies should include both quantitative feedback and qualitative feedback for a more elaborate assessment.

Additional convenient solutions like avatar-based teleconsultations and artificial intelligence-based care reminders seem to supplement the heart failure patient experience, especially those requiring extra self-management assistance. Gingele et al. discussed significantly positive results in the early implementation of avatar technology that enhanced avatars' inclination for individual care delivery (11). Hence, El Jamal et al. pointed out that elderly patients are likely to benefit since they do not have to make frequent physical visits and continue receiving their treatment (12). These findings are relevant to the elderly cohort in this study because most of the participants can be relieved that they do not go to the hospital frequently, but they will receive organized medical supervision. Telemedicine also provides other categories of healthcare providers the chance to become involved in treating chronic diseases. Specifically, Supriyanti et al. showed that through telemedicine intervention, nurses were able to make a positive impact on chronic disease patients with additional focus on education and training for individual patient monitoring (13). This aligns well with the approach applied in the study, which received input from both nurses and telehealth coordinators besides cardiologists. They can also help to guarantee that patient inquiries are responded to on time and interventions are provided on time.

Additionally, Bernocchi et al. developed a home-based chronic disease management model for heart failure and diabetes, which proves that telemedicine is feasible and cost-effective if a single mode of management manages both diseases. Since most heart failure patients present with other conditions, future usage of telemedicine should incorporate a holistic disease process approach. Tedeschi et al. have pointed out that through the use of telehealth, the reach of care offering can be beyond the physical geographical drawings and that care can be sustained over time, and with clients who often have very limited access to health care (15). This is especially true in Pakistan since most cardiologists and tertiary care facilities are confined to higher Provinces. Lastly, the study confirms that other studies have demonstrated that telemedicine is useful in increasing the success rate associated with chronic heart

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failure and patients' liking it. Those attaining the perspectives of patients and the healthcare facilities that offer those therapies pose particular challenges regarding technology and infrastructure, despite the fact that different spectrum of general benefits accrues to both patient and medical care. Sustaining and scaling up these interventions in the long term will also require advanced investments in digital platforms for health management, staff training, and patient awareness.

CONCLUSION

This paper focuses on the benefits of telemedicine in enhancing clinical outcomes and satisfaction of patients with chronic heart failure. This is because the improved structured telehealth care plan considerably decreased the patients' hospital readmissions and emergency visits and enhanced the NYHA functional class and self-reported symptomatic regulation. Patients' satisfaction was high mainly because the proposed model improved convenience, communication, and the timeliness of care. These concord with other studies from developed countries supporting telemedicine as a feasible and sustainable model of disease control in chronic diseases, especially in low-resource countries like Pakistan. Despite these difficulties encountered with technology, the percentages that had to do with compliance and satisfaction were assuring. Other features, such as the use of multiple disciplines in caregiving and easy-to-navigate tools, also added to the success of the program. Future studies should concentrate on access and use of telemedicine, as well as on integrating telemedicine into routine clinical practices to minimize gaps in heart failure care services.

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