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THE IMPLEMENTATION OF DIGITAL TECHNOLOGY TO SUPPORT SELF-CARE AMONG HEART FAILURE PATIENTS: A LITERATURE REVIEW

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ABSTRACT
Heart failure has high morbidity and mortality rates, with a prevalence ranging from 1–2% in the adult population, increasing to more than 10% in people over 70 years of age. Self-care abilities are very low. Technologies such as mHealth, telemonitoring, and SMS can support the education and monitoring of heart failure patients. Objective to evaluate the impact of digital self-care education interventions on improving the behavior and quality of life of heart failure patients. A systematic literature review was conducted using the PRISMA 2020 guidelines, searching databases including PubMed, ScienceDirect, Wiley Online Library, and Clinical Key for Nursing from 2020 to 2025. 10 articles meeting the criteria were identified and analyzed using the JBI tool and 10 article in review. Digital interventions such as mHealth applications, Bluetooth, and educational SMS messages can improve self-care maintenance, symptom recognition, adherence, and quality of life in patients ($p < 0.05–0.001$). Like medication reminders, symptom alarms can improve and strengthen self-care. However, changes in patient behavior have not fully affected key indicators, such as NT-proBNP, for short-term hospitalization. Digital self-care can improve self-care behaviors among nurses in educating heart failure patients and has the potential to increase independence and quality of life. Long-term research is needed to examine the effect on symptom severity in heart failure patients.

Keywords: digital health; education; heart failure; self-care

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INTRODUCTION

Heart failure continues to be a major global health burden due to its high morbidity and mortality, especially within healthcare facilities. Patients frequently experience distressing symptoms such as fatigue and dyspnea, compounded by the complexity of the condition. In such situations, patients are encouraged to rest and engage in appropriate self-care to prevent further clinical deterioration (Davoudi et al., 2020). Self-management approaches for chronic conditions emphasize patient empowerment through education and self-monitoring, making them highly relevant for self-care training programs in individuals with heart failure (Kurnia, 2024). Evidence also suggests that self-care behaviors particularly those incorporating spiritual approaches significantly contribute to symptom reduction and improve symptom control in patients with various chronic diseases (Maria, 2022).

Digital health technologies, including m-health, telemonitoring, SMS reminders, Bluetooth-enabled devices, and mobile applications, have shown substantial benefits for heart failure patients. Recent digital interventions have demonstrated significant positive effects on heart failure outcomes and have supported self-management and self-efficacy. Smartphone-based systems that integrate education, medication adherence monitoring, and daily symptom tracking have been proven to be beneficial for patients with heart failure (Davoudi et al., 2020). TheManage The HF4Life

smartphone application similarly supports self-care practices, physical activity, and quality of life (Dorsch et al., 2021).

Other self-management applications equipped with automated feedback systems have also demonstrated effectiveness. The App-Care Heart Failure study from Japan reported that an application with alert functions significantly improved monitoring adherence to over 80% (Yokota et al., 2023). The SmartLife Heart Failure application, which includes a nurse-chat function, further enhanced self-care behaviors (Choi et al., 2023). A multicenter RCT, SMART-HF, which integrated an application with Bluetooth devices to monitor blood pressure, heart rhythm, and weight, demonstrated reductions in patient dyspnea and improved treatment adherence (Yoon et al., 2024).

SMS-based interventions remain attractive due to their cost-effectiveness and accessibility. The largest RCT to date, MESSAGE-HF, incorporated SMS education into routine care; although SMS education did not impact NT-proBNP levels or some key clinical outcomes, statistically, four daily SMS messages improved self-care scores (Rohde et al., 2023/2024). Another study found that WhatsApp-based clinical education contributed positively to patients' self-monitoring abilities (Schönhofen et al., 2023). Research evaluating six months of automated SMS messages also sought to establish patterns of sustained self-care behavior (Bressman et al., 2024). Further evidence indicates that 24-week SMS education yielded better improvements than conventional patient education in e-Health literacy, self-care knowledge, and self-care practices (Son et al., 2023).

Several reviews of randomized controlled trials (RCTs) highlight that digital solutions combining applications, Bluetooth devices, and SMS can enhance self-management, self-efficacy, quality of life, and medication adherence among heart failure patients. These digital tools hold strong potential for strengthening chronic disease self-management. The use of advanced digital applications for self-care in heart failure supports the need for fully integrated, customizable, and user-friendly digital self-management models. Designing health systems that ensure full interoperability and seamless integration of digital interventions should therefore be a primary focus moving forward. Aims this article To evaluate the impact of digital self-care education interventions on improving the behavior and quality of life of heart failure patients.

METHOD

This study was conducted using a systematic literature review following the PRISMA 2020 guidelines. Articles were searched through several scientific databases, including PubMed, ScienceDirect, Wiley Online Library, and ClinicalKey for Nursing. The search strategy used keywords such as “Heart Failure,” “Self-Care,” “Education,” “Self-Management,” and “Digital Health,” combined with Boolean operators AND/OR, along with manual screening to ensure relevant and comprehensive literature.

The inclusion criteria were: articles published in English or Indonesian, available in full text, published between 2019 and 2025, and discussing educational or self-care interventions for heart failure patients. Excluded were editorials, commentaries, short reports, and other non-empirical publications. The selection process consisted of identification, title and abstract screening, and full-text review. Methodological quality was assessed using the Joanna Briggs Institute (JBI) critical appraisal tools, and only articles meeting adequate methodological standards were included in the final synthesis. Article searching was conducted from January to February 2025, and reference management was performed using Mendeley.

A total of 476 articles were initially identified. After removing 71 duplicates, 405 articles remained for title and abstract screening. Of these, 38 articles underwent full-text reviews, and 10 articles met all inclusion criteria for final analysis. The selection process was carried out independently by two reviewers, and disagreements were resolved through discussion. The 2019–2025 range was chosen

to ensure that the included literature reflects recent developments in self-care interventions and the use of digital health technologies for patients with heart failure.

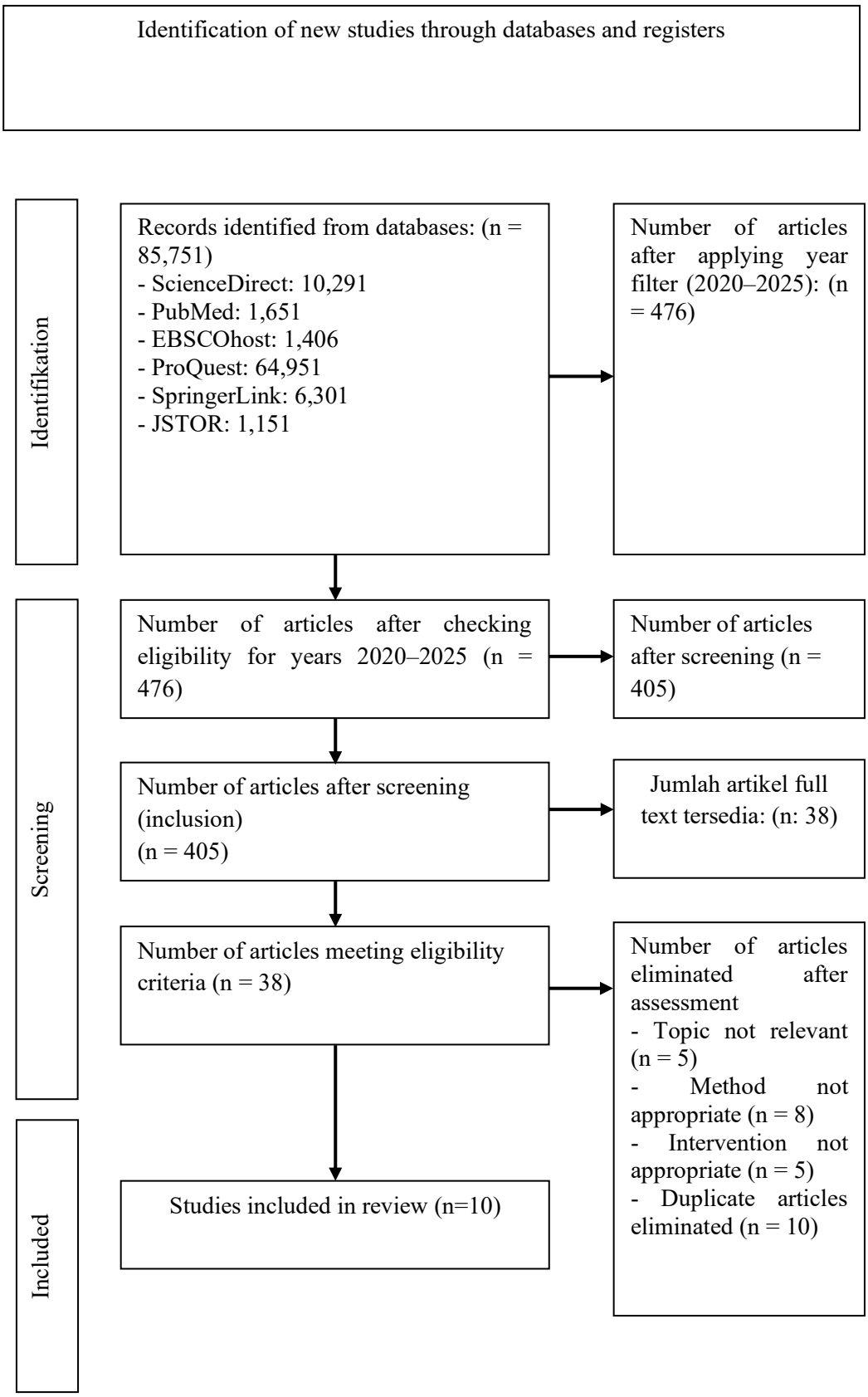

Figure 1. Prisma Diagram

RESULT

Table 1.
Mapping Results From Articles

No	Title / Author / Year Country	Study Design	Objective	Population	Sample	Intervention	Study Results	P value
1	Davoudi et al. 2020 (Iran) Effect of a Smartphone-Based Application on Quality of Life in Patients With Heart Failure: A Randomized Controlled Trial	RCT	Assessing the effectiveness of smartphone applications on quality of life and symptom control of HF patients over 3 months.	Outpatient stable HF patient, NYHA II–III.	120	Smartphone app includes self-education, medication reminders, daily symptom & weight monitoring.	The intervention group experienced significant improvements in QoL, self-care maintenance, and decreased symptoms compared to the control.	p < 0.05
2	Dorsch et al. 2021 (USA) *ManageHF4Life: A Randomized Controlled Trial of a Mobile Application to Improve Self-Management and Quality of Life in Heart Failure Patients*	RCT	Assessing the impact of the ManageHF4Life app on QoL, self-management, physical activity, and readmission.	Outpatient chronic HF patients aged 40–85 years.	182	The mobile app includes educational modules, symptom tracking, physical activity, and coaching.	Improved self-management scores -, QoL (Kansas City Cardiomyopathy Questionnaire), and physical activity; decreased readmission trend.	p < 0.05
3	Yokota et al. 2023 (Japan) *AppCare-HF: A Feasibility Randomized Controlled Trial of a Mobile Application for Heart Failure Self-Care*	Feasibility RCT	Testing the feasibility, usability, and compliance of the AppCare-HF application.	Stable HF patients from several university hospitals.	60	AppCare-HF: daily monitoring, interactive education, abnormal symptom alarms.	Compliance >80%, high usability, increased self-monitoring & self-care maintenance.	p < 0.05
4	Choi EY et al. 2023 (Korea) *Effectiveness of the Smart Life–HF Mobile Application on Self-Care and Symptom Control in Patients With Heart Failure: A Randomized Controlled Trial*	RCT	Evaluating the Smart Life-HF app to improve self-care and symptom control.	Adult outpatient HF patients.	98	An app with a symptom diary, education, Q&A, and nurse -chat access.	Improvement of HF symptoms, increased self-care confidence & symptom management.	p < 0.01
5	Yoon et al. 2024 (Korea) *SMART-HF Trial: A Multicenter Randomized*	Multicenter RCT	Assessing the effectiveness of app + Bluetooth device + automatic	NYHA II–III HF patients with smartphones.	220	App + Bluetooth BP, HR, scale + clinical automatic feedback.	Decreased dyspnea, increased adherence, increased self-care maintenance.	p < 0.05

No	Title / Author / Country	Year	Study Design	Objective	Population	Sample	Intervention	Study Results	P value
	Controlled Trial of Mobile App + Bluetooth Monitoring for Heart Failure Self-Care			feedback system.					
6	Rohde et al. (Brazil) *MESSAGE-HF: A Randomized Controlled Trial of Intensive SMS Education and Monitoring After Hospital Discharge in Heart Failure Patients*	2023–2024	RCT	Testing the effect of educational SMS and intensive monitoring after HF hospitalization.	HF patients have recently been discharged from hospital within the last 14 days.	699	4× daily SMS containing education, automatic triage, medication reminders, clinical alerts.	Self-care significantly improved; did not decrease NT-proBNP or major clinical events.	$p < 0.001$ (self-care)
7	FarzanehRad et al. (Iran) *Effectiveness of Educational Text Messages vs. Pillbox Organizer on Medication Adherence in Patients With Heart Failure: A Randomized Controlled Trial*	2024	RCT	Comparing educational text messages vs. pillbox organizers on HF medication adherence.	HF patients aged 30–80 years with standard HF therapy.	150	Tailored text messages contain medication education, reminders, and side effect alarms.	Adherence increased significantly in the text group compared to the control & pillbox.	$p < 0.01$
8	Schönhofen et al. (Brazil) *WhatsApp-Based Educational Support for Heart Failure Patients: A Pilot Randomized Controlled Trial*	2023	RCT Pilot	Assessing the use of weekly WhatsApp messages for -HF follow-up.	Stable HF outpatient.	60	Weekly WhatsApp education + self-monitoring request.	Feasible; increased self-care maintenance & symptom monitoring.	$p < 0.05$
9	Bressman et al. (USA) *Automated Text Messaging to Improve Heart Failure Self-Care Engagement: A Randomized Controlled Trial*	2024	RCT	Assessing an automated texting program to enhance self-care engagement.	Community-acquired chronic HF patients.	274	Automated Way -to -Health texting program (daily messages, self-report prompts).	Significant improvement in self-care behavior & adherence to monitoring.	$p < 0.05$

No	Title / Author / Year / Country	Study Design	Objective	Population	Sample	Intervention	Study Results	P value
10	Son YJ et al. 2023 (Korea) *Interactive Mobile and SMS Program to Improve Knowledge, eHealth Literacy, and Self-Care in Heart Failure Patients: A Pilot Randomized Controlled Trial*	RCT Pilot	Testing a 24-week interactive mobile + SMS intervention to improve knowledge & self-care.	Community-dwelling adult HF patients.	84	Mobile education + interactive SMS (feedback, quizzes, reminders).	Increased knowledge, eHealth literacy, self-care maintenance & confidence.	p < 0.01

Analysis of 10 articles showed that digital interventions, delivered through mHealth applications,

Intervention	Davoudi et al. (2020)	Dorsch et al. (2021)	Yokota et al. (2023)	Choi et al. (2023)	Yoon et al. (2024)	Rohde et al. (2023–2024)	FarzanehRad et al. (2024)	Schönhofen et al. (2023)	Bressman et al. (2024)	Son YJ et al. (2023)
mHealth Application	✔	✔	✔	✔	✔					✔
mHealth + wearable devices					✔ (Bluetooth BP/HR/Scale)					
educational SMS						✔ (intensive 4x/day)	✔ (drug reminder)	✔ (Weekly WhatsApp)	✔ (automated texting)	✔ (interactive SMS)
Tablet / education & monitoring platform										
Interview / face to face		✔ (coaching)								

Bluetooth devices, or SMS, consistently improved self-care behaviors in patients with heart failure. All studies reported digital education, symptom monitoring, medication reminders, and interactive features such as alarms or communication between patients and nurses, which enhanced self-care maintenance and adherence. Improvements were observed in quality of life, symptom management (eg, fatigue, dyspnea), and daily monitoring adherence. Significant outcomes ranged from $p < 0.05$ to $p < 0.001$, supporting the effectiveness of digital interventions in promoting self-care behavior. Daily educational programs and SMS-based interventions were particularly effective, increasing patient engagement and knowledge regarding self-care management. Several studies reported that educational messages and reminders via SMS significantly improved self-care scores ($p < 0.01$). Overall, digital interventions—whether via apps or SMS—were effective strategies for promoting long-term self-care behaviors in patients with chronic heart failure.

DISCUSSION

This systematic review indicates that digital interventions contribute significantly to self-care and heart failure management by providing continuous education, symptom monitoring, and support for cognitive and psychomotor skills in self-management. mHealth applications facilitate patient autonomy, offering reminders and structured platforms that promote independent care. Monitoring features, including Bluetooth-enabled devices and alarms, provided significant benefits in symptom tracking and patient experience. Active monitoring features were found to be more effective than passive digital interventions in stabilizing patient conditions.

SMS-based interventions were particularly effective in improving adherence due to their simplicity, low cost, and accessibility across age groups, including patients with low digital literacy.

Educational messages via SMS increased patient understanding, motivation, and consistent self-care behaviors, with significant effects reported at $p < 0.05$ to $p < 0.001$. Despite improvements in self-care behaviors, digital interventions did not always translate into significant clinical outcomes, such as reductions in NT-proBNP levels or hospital readmissions in the short term. Variability in patient age and heart failure severity may influence intervention effectiveness. Overall, digital interventions provide an efficient and flexible approach to nursing practice, supporting patient education, adherence, and self-management, and form the basis for developing systematic training programs and ongoing digital education for heart failure patients.

CONCLUSION

Digital interventions play a crucial role in improving self-care behaviors in patients with heart failure. mHealth applications support physiological monitoring, while SMS interventions significantly enhance self-care maintenance, self-care confidence, symptom monitoring, and adherence. Digital education consistently strengthens patient self-management skills. These findings confirm that digital technologies are effective, easily implementable strategies in nursing practice, especially for heart failure patients. By increasing patient autonomy, digital interventions can also contribute to improved quality of life.

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